THE

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THE REPORT ON ELECTRIC MAINS EXPLOSIONS.

WHEN explosions first took place in connection with mains for the distribution of electrical energy, it was natural, and probably correct, to ascribe them to the presence of coal gas derived from the network of pipes in close proximity to the electrical lines. Usually the explosions were in underground boxes which were obviously well adapted for the accumulation of gas escaping from a leaky pipe. When, however, explosions began to occur on mains laid on the solid system and in which it was clear to any fair-minded man that coal gas could not well be the agent of destruction, it became necessary to look nearer home and inquire whether the electric main itself might not supply the gaseous mixture as well as the means of its ignition.

Some 14 or 15 years ago it was clearly brought home to at least one well-known authority in connection with a bad fault that occurred within his experience, that mains laid solid in bitumen could generate large quantities of highly explosive gas. On his arrival at the site of the damage, a flame three or four feet high was seen escaping from between the flagstones with great violence, and the natural inference was that a gas main had been fused and the gas ignited. On opening out the ground, however, it proved to be due entirely to cables laid solid in bitumen.

The knowledge that bitumen could give rise to such dangerous conditions was probably confined to comparatively few persons for a number of years, none of whom were anxious to publish the information in their possession, and it is only recently that it has become public property.

So alarming was the danger from this cause considered at the end of 1913 that a Committee, consisting of Messrs. Robert Nelson, W. Slingo, James Swinburne and Alexander P. Trotter, with Sir T. Edward Thorpe as chairman, was appointed to consider the causes of explosions in connection with bitumen used for cable laying, and what steps should be taken to prevent them in future.

This Committee, after hearing evidence from some 14 witnesses, comprising central station engineers, cable manufacturers, consulting engineers and scientific experts, has just presented its report, of which we give a lengthy abstract in this issue. The most striking thing about this document is the contradictory nature of the evidence given, and, probably as a consequence, the indecision in the conclusions arrived at. The report itself, through which are scattered traces of humour, rare in a Government publication, is somewhat discursive, the arrangement having little method and certain matter of doubtful relevancy being rather dragged in.

It is curious that it is tacitly assumed that the whole danger of the formation of an explosive mixture arises from the bitumen filling, the insulating and protecting covering of the cable itself being wholly ignored. It is within our experience that a most serious explosion can arise with no other source for the gas than these coverings Some 18 years ago a striking instance of this cause came

under observation. Two lengths of culvert, containing bare copper, were connected at a street crossing by rubber cables, of the best quality then obtainable, laid in a pipe, which cables became faulty. Destructive distillation of the rubber and braiding took place, with the result that one of the pits in which the cables were joined to the bare copper, and the whole of the culvert communicating with this pit, were filled with gas derived solely from the cables, and on ignition a violent explosion took place, disturbing the flagstones over the entire length of culvert, and damaging the basement of the building alongside which the culvert ran. Other examples of exactly the same thing could be cited. It is thus evident that with drawing-in systems risk of serious explosion may arise if the cables are not lead-covered, in spite of the fact that there is not an ounce of bitumen or pitch filling present.

The report begins by reciting the facts that led to the inquiry being held, and states that explosions of the kind under investigation have only taken place in connection with single-core separately laid cables, insulated with rubber or vulcanised bitumen, and that all serious explosions in houses have been in connection with vulcanised bitumen cables laid solid or in bitumen casing. Too much reliance should not be placed on this latter statement, as, though it is possible that no serious explosions have been reported as occurring with non-lead-covered cables drawn into pipes for services, it would be most regrettable if it were assumed that such services gave immunity from risk of explosion; as a matter of fact there can be no question that cables so laid are peculiarly liable to faults, and the conditions are highly favourable to the products of the distillation of their coverings entering the house and exploding. No unstopped pipe should ever be allowed to enter a building.

It is quite fairly pointed out that although thousands of separate cables have been laid on the solid system, the number of serious accidents has been small. It is curious, however, that it should be stated: "gradual deterioration sometimes takes place," and that "failures have occurred on cables which have been laid for 10 or 20 years, but on taking them up the bulk has been found to be in perfect condition." It would seem as though gradual deterioration and occasional failures were remarkable or peculiar to the solid system of laying mains. Surely it must be anticipated that all mains will deteriorate in time, and all experience goes to show that the rate of deterioration is less with the solid system than with any other in which continuously insulated cables are employed.

As a general rule, it is stated that explosions have taken place in large, and not in small towns, and this is ascribed to the relatively high resistance of the main cables in use in small towns. This explanation is open to grave doubt, for although much larger cables are, of course, used in the big towns, there is no large town without long lengths of small cables, and the resistance between the fault and a heavy main there is likely to be as high as between the fault and the generating station in the small town, for, after all, every station, however mean, has to look after its drop. A much more likely explanation would seem to be that in a small town every cable can be made a household pet, and faults can be detected and removed at an early stage, whereas in a large one the cables have to rough it and take their chance, a leak having to be fairly bad before it is noticeable at all amid the general distributed leakage.

A brief account of the kinds of fault experienced on vulcanised bitumen cables laid solid and their results is given, and it is pointed out that, as single cables of this kind laid in this manner rarely give a metal to metal dead short, they can be, and often are, run on while a fault is present, whereas concentric, three-core, and lead-covered cables generally, when faulty, cause such serious trouble that means are usually taken to cut them out automatically, and, it may be added, interrupt the supply to consumers supplied from them. Nothing is said about the drawbacks of these other cables which are not shared by vulcanised bitumen.

Rubber cables, which most central-station engineers regard with distrust of the deepest, are spoken of rather favourably, though somewhat inconsistently. On page 3 of the report, it is stated: "Although at one time vulcanised rubber cables of excellent quality were made, and it appears might still be made at a higher price, inferior qualities have given trouble." On page 5 we are told: "Rubber mains of poor quality having been abandoned and those of good quality giving no trouble . . . " Some of those who in the early days were afflicted with rubber cables which were sold as being of the highest grade by makers of the best reputation would be interested to know who were the fortunate individuals who got the cables of "excellent quality," and it would be equally interesting to know who is putting down rubber mains of good quality nowadays; the Committee does not seem very sure, as it says these high-class cables "might be," not "are" made. The conclusion arrived at is that all bad cases of explosion have been due to simple vulcanised-bitumen insulated cables drawn into bitumen casing or laid solid in Trinidad bitumen or in pitch.

Subdivision of the mains into districts and careful localisation and repair of faults have resulted in no explosions of bitumen gas occurring on mains laid in bitumen casing, so that the question is narrowed down to the solid system with bitumen or pitch. The relative properties of the two fillings are stated, but there was much conflict of evidence on the subject. The same remark applies to the best material to be used for the troughing, witnesses having large practical experience of main-laying and maintenance holding diametrically opposed views, but the Committee apparently has no hesitation in saying: "Earthenware troughs with separate chases, or a separate trough for each cable, is the best method," so there is nothing more to be said, and all the witnesses will know what to use in future. Some of them, however, may be forgiven if they are sometimes haunted with thoughts of the fragile nature of earthenware, the want of truth in the troughs which may lead to varying thickness of the protective covering of their cables, the liability to damage of the cables at the numerous joints in the troughing and other drawbacks, all ignored by the Committee, to say nothing of the bulky nature of the troughs in a crowded street.

The importance of giving proper care to service joints is pointed out, though it can hardly be regarded as a discovery of the Committee, and the danger of damage at bends is very properly emphasised. Bad work is often done at bends, and mains have been taken up in which the cables were resting on the sharp edges of the dividing bridges instead of in the grooves, it need hardly be said, with disastrous results. The Committee recommends that bridges should be omitted altogether at bends, but this can hardly be so good as retaining the bridges and putting them in with special care so as to ensure their being properly fixed. With the method favoured by the Committee, the cables will almost certainly rest on the bottom of the trough in course of time, and the protection of the bitumen will be lost, thus destroying the whole *raison d'être* of the solid system, *i.e.*, the surrounding of all cables at all points with a covering impervious to moisture.

The danger arising from a pavement over the main through which the gas cannot escape is rightly indicated, as the gas will tend to force its way into adjacent houses. It is recommended that mains should not be laid too near the buildings from the stingy motive of saving cost of services.

It is assumed that services from vulcanised bitumen mains must be made with cables insulated in the same manner, though the reason for this is not stated. Armoured service cables are recommended, while the taking of the solid system into the house is condemned. It is, nevertheless, admitted that there are over 10,000 services on the solid system in one Midland city on which there has never been a single fault.

The report next makes a long digression on the subject of testing and insulation, which, though no doubt interesting in itself, does not appear to have much bearing on bitumen explosions.

The burning-out of faults is naturally viewed with disfavour, and that some central-station engineers are of the same mind is shown by the case of one extraordinary individual who "prefers to keep no less than 206 districts electrically separate, connected neither by fuses nor links." One would think he must be the owner of a copper mine!

Next follow some remarks on fuses, and the views of witnesses are cited who thought that the maximum current in a district should be limited to amounts varying from 300

to 800 amperes, though it is admitted that some prefer a single network with an occasional burn-out; perhaps the two views might be summed up by a heretic as thousands of fuses, uncertain, and possibly dangerous, in their action, and ever present as a source of expense, anxiety, and annoyance *versus* one which only appears when it is wanted, requires no maintenance, will most probably act, and may be dangerous. It would seem that the witness who would subdivide his network into 300-ampere districts had not much faith in electric heating or cooking.

The Committee next proceeds to its "Conclusions." The blame for explosions is laid on vulcanised bitumen-insulated cables, carrying continuous current, laid solid, or in bitumen casing. A clean bill of health is given to all alternating-current mains and concentric, three-core and lead-covered paper-insulated cables. Pitch as a filling for the solid system is looked at with suspicion, the absence of explosion where it has been employed being ascribed, with good reason, to the relatively small amount of it used as compared with Trinidad bitumen. In spite of its condemnation, the Committee does not recommend the Board of Trade to cease approving vulcanised bitumen cables laid solid, or to exclude wood troughing, but it does recommend separate troughs with 2 in. of sand between them.

The Committee makes definite recommendations that separate mains on the solid system should not be laid under impervious pavements, or close to walls of buildings, that armoured services should be used, and that they should be taken into buildings in such a manner that gas cannot enter, and it makes certain recommendations as to the mode of laying cables at bends. Finally, it draws attention to the Board of Trade regulations which require notification of fires and explosions, and recommends the publication of reports on such accidents.

So ends the Report itself, and it must be confessed that it is singularly disappointing. The conclusions arrived at are so lame and halting that no appreciable additional security to the public is afforded, and, while nothing of importance is forbidden, serious damage will probably be done to the prestige of a class of cable laid in a particular manner that, viewed from the general standpoint of all-round merit, rather than from the narrow one of a possible explosion once in a blue moon, has probably given, and will continue to give, by far the best results of any continuously insulated main on continuous current networks.

That the possibility of explosion with separate cables on the solid system cannot be wholly eliminated, we would be the last to deny, but the same or other dangers hardly, if at all, less serious exist with other systems of continuously insulated cables. The opinion is still held by some, even though it be an unfashionable and antiquated one at the present day, the only thoroughly safe, convenient and indefinitely durable main for continuous current distribution in districts in which a heavy demand exists (*i.e.*, in the large towns in which alone, we are told, explosions have occurred) is bare copper, strained between suitable porcelain insulators, in concrete culverts.

The report is accompanied by two appendices, to which we hope to refer next week.

Copper.

TRUE to its traditions, no sooner did copper wear an utterly dejected appearance and appear to be without a friend, than the market took a swift turn for the better, and with advancing prices a substantial amount of buying was released, which has done a good deal to render the position of producers more comfortable. The entire outside conditions of the trade had become poor. There were financial difficulties in metals generally, and while it is true that these were connected more with tin than with copper, they nevertheless exercised a depressing influence, while the share markets in the United States were quite discouraging.

With the removal of the more particular difficulties to which allusion is made, however, copper very quickly picked up. Producers who had been vainly trying to market copper, and who, in the attempt to quit stocks, had accepted down to a shade below £62 for electrolytic, suddenly realised that temporarily at least prices had grounded, and under the lead of some of the more important people an upward movement was started. Due credit for this must, however, be given where it is owing, and that is to American speculators, who sent good buying orders for standard copper based apparently upon the belief that the rate decision would be issued in a few days, and that it would be favourable to the railway companies. So much importance, however, is generally attached to this decision, and there has been so much talk about what it would mean as regards the general industrial position of the United States, should it prove favourable, that the chances are very much in the direction of its falling flat when it actually makes its appearance.

It is preposterous to imagine that a mere judicial decision can make or mar the industrial operations of a great nation, yet people talk as if this were so. Sentimentally, of course, it could help matters forward, but it is a matter of time for the course of affairs industrial to be really altered. The tone of the European markets has, however, been decidedly improved, and it is quite plain that there is a good deal of buying to be done, both of refined and of manufactured material. There has been rather more doing in the United States, too, though there is a very general inclination to hold back there until the outlook is more clearly defined.

The European statistics for the month of June were by no means bad, even if they were not exactly good. The European visible supply at the end of the month was 33,171 tons, against 32,370 tons a month previously, while the stocks of standard copper were 14,374 tons, compared with 12,429 tons on May 31st, the stocks in England and France being 20,464 tons, against 18,618 tons a month ago. The quantities coming into sight during the month totalled 50,636 tons, North America 36,086 tons, Spain and Portugal 3,209 tons, and other countries 5,471 tons. The Chile shipments were 3,500 tons, and those from Australia 2,550 tons, the month's deliveries being 49,735 tons. The next United States statistics are expected to be fairly satisfactory, but for all this they will probably show a moderate increase in the stocks in the hands of the refineries.

Another Australian Wages Award.

WE have received particulars of another award affecting the wages of electrical workers which has been made by Mr. Justice Higgins, the President of the Commonwealth Court of Conciliation and Arbitration. This award affects telegraph and telephone linemen, who through their Union had claimed higher wages, shorter hours, and improvements in their employment conditions.

It was stated that the number of workers affected by the decision was 3,114, most of whom were members of the Union. The Judge, in his award, held that the work was intermediate between skilled and unskilled. It necessitated the power to read, understand and obey a number of official instructions, and to make, in some cases, fairly complete reports. The Union wanted a minimum wage on the basis of £150; the employers were paying £132; the new award is £138. This means £11 10s. per month. Linemen in charge are to be paid £168; line foremen £186; and line inspectors £216. Provision is made for increments of pay with long service for linemen up to £168, linemen in charge up to £186, line foremen up to £210, and line inspectors up to £264, with possible further increases at the discretion of the Commissioner up to £360.

The hours are defined as 46½ per week, or if employed in tunnel work 44 per week. For Sunday work time and a half is to be paid, and for duty on public holidays double time.

The remainder of the award deals with district allowances, forage allowances, holidays, the establishment of a Board of Reference composed of representatives of employers and workers, and the special rates to be paid in Western Australia. To prevent accidents it is ordered that all poles are to be thoroughly examined for decay or ant holes at least once a year.

THE BETULANDER RELAY AUTOMATIC TELEPHONE SYSTEM.

This system, to which we briefly referred in our last issue, is one in which the whole of the operations in a telephone exchange of connecting subscriber to subscriber, ringing, and disconnecting are performed entirely by relays.

These relays are of the ordinary telephone type which have been used in practice in central-battery manual exchanges throughout the world for the last 15 to 20 years. They are familiar and well-tried simple units, and are thoroughly reliable. There are no moving parts, as generally understood, to get out of order, for the whole of the operations are performed by these simple units.

The new system, invented by Messrs. Betulander and Palmgren, Swedish engineers, differs most strikingly from all systems employing electro-mechanical devices which have movement in one or two directions (vertical and rotary), and which after performing the operations of selecting and connecting idle junction lines and subscribers' lines remain associated with the completed connection; these devices are thus doing no useful work during the period of conversation, whereas in the Betulander relay system the common relay groups, equivalent to the electro-mechanical devices mentioned above, after connecting calling line to junction, and junction to junction as required by the size of the system, free themselves from the circuit immediately it is set up and are instantly available for setting up other connections, which is their only function; they are, in fact, comparable with the hands and brain of the operator in a manual exchange.

The relay selector and connector units may be likened to electrical operators which first test the line wanted, and if it is disengaged, connect with the calling line and with a junction just as an A operator on a manual system would insert an answering plug in the jack of the line calling, and a calling plug in the outgoing junction jack, and go out of circuit. At the next link the electrical operator would connect the junction line and the subscriber wanted, in a 1,000-line exchange, just as the operator would on a manual system, and go out of circuit.

The talking circuit from subscriber to subscriber is then held and controlled by relays, which break the circuit and return all sections to their normal condition when the receiver at the subscriber's station is replaced on the rest.

It would appear extraordinary if the operator in a manually operated exchange were to hold the plugs in the jacks during the conversation, but this is practically what is being done in automatic systems by retaining a complicated electro-mechanical operator tied up to a connection at each stage of the connection, as in all other automatic systems.

The basic principle which permits of all the operations being carried out entirely by relays is a series of "link lines" comparable with a number of double-cord circuits of a manual exchange, which, at the first stage of a call, effect a connection between the calling line and an idle outgoing junction leading to the ten thousands, thousands or hundreds group, depending upon the size of the exchange. The subsequent stages down to the tens, and the individual unit required, are reached in exactly the same way, and when the connection is set up the various groups of common relays which searched for the idle junctions, and responded to the impulses from the subscriber's instrument from stage to stage of the call, immediately free themselves from the connection and take charge of other calls. When a connection is completed, the two subscribers are connected by a transmission circuit on the "Stone" system equal to that employed in the best central-battery manual practice.

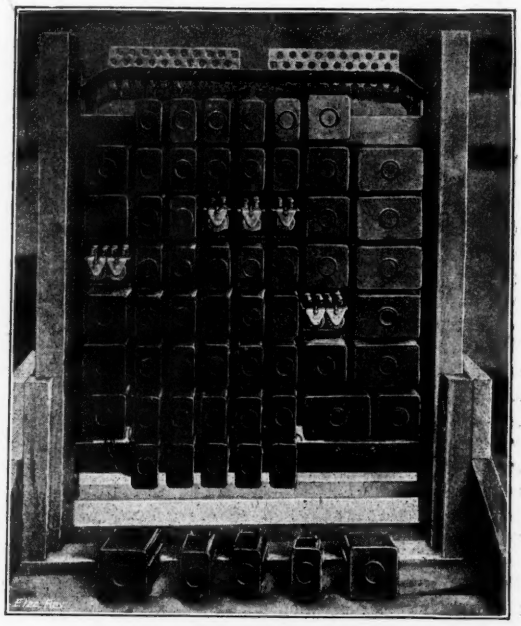


Fig. 2.—Front View of Subscribers' Section of Relays.

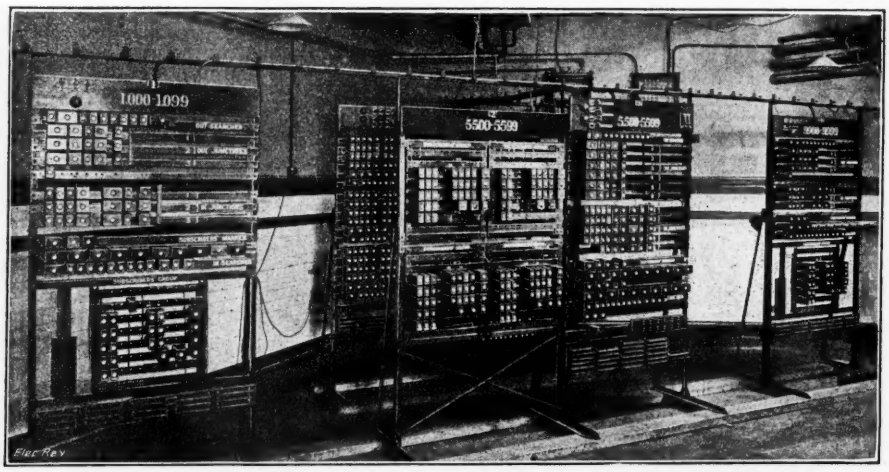


Fig. 1.—Experimental Installation of the Betulander Relay Automatic Exchange at Marconi House.

The apparatus installed at Marconi House is of an experimental character, designed to illustrate the operation and possibilities of the system; it consists of three sections, respectively representing the ends and the middle of a ten-thousand line exchange, so that calls can be made from any one to any other of these sections. The illustration, fig. 1, therefore does not represent a complete installation, but is intended to show two things—the general appearance of the apparatus, and the supremely important fact that it consists of *nothing but racks of ordinary relays*. Figs. 2 and 3, however, show the front and back of an actual completed 5-line panel which is to be used in building up a 100-line exchange in Marconi House. The wiring is not more elaborate than in a manual exchange—the costly subscribers' multiple is entirely omitted—and

every bit of the apparatus and wiring is accessible. The Betulander system depends on the life of its relays, in which there is the minimum of friction, and the points of contact are either of gold-silver alloy or platinum. Telephone relays of the standard type have been in use in this country for about 14 years, and they appear to be as good, and give as little trouble, as when first fitted. Some of the relays are shown in fig. 4.

It has become necessary with electromechanical switches to take special precautions to keep the air of the rooms equable as regards temperature, dryness and freedom from dust. With a relay apparatus this trouble is greatly reduced, as the relays are enclosed in cases of small dimensions; therefore, when trouble arises, it is only necessary to expose a very small portion of the apparatus, the rest remaining dust and damp-proof.

Experience with great masses of relays in this country on central-battery systems shows that with individual covers,

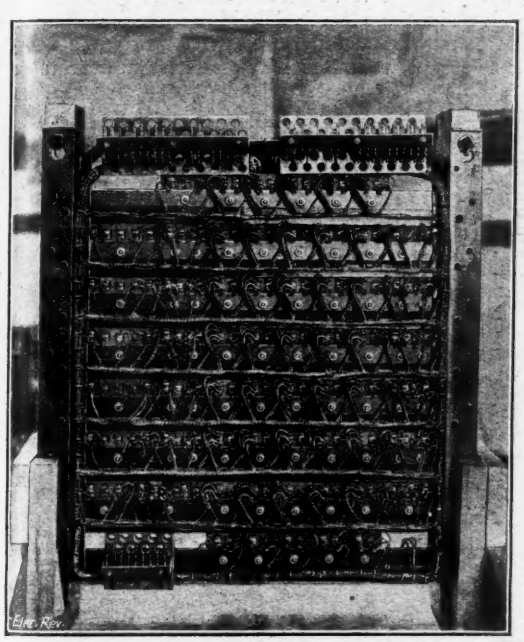


FIG. 3.—BACK VIEW OF RELAY PANEL.

or covers for strips of 10 pairs, there is practically no trouble, and that they will work for many years without attention, their adjustment remaining unaltered.

In the manually-operated system it is customary to speak of "double-cord" and "single-cord" working. The subscribers', or "A" positions, are worked "double cord," *i.e.*,

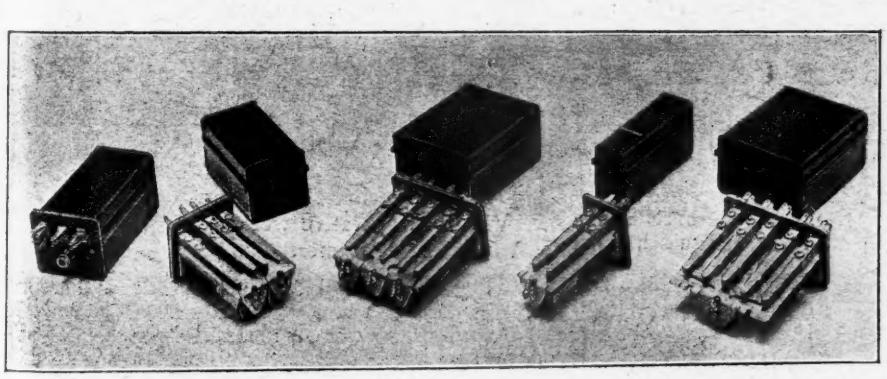


FIG. 4.—SOME OF THE BETULANDER RELAYS AND THEIR COVERS.

a cord broken centrally to admit the operator's telephone, has each end terminated in a plug. At the "B" position the incoming junction lines end in a cord and a plug, and are spoken of as being worked "single cord."

The Betulander relay system of working is equivalent to the "double-cord" working, and the equivalent to the cord is known as an "intermediate line" or "link." In a three-figure installation (999) lines, there would be :—

A "primary link" which is equal to the line switch or pre-selector of other automatic systems, and connects the subscriber's line to a junction automatically when the receiver is lifted.

A "first junction" in which there is a condenser in each line, a device for feeding current to the calling line, and an impulse repeating device.

A "main link" which connects two junction lines together, the associated "relay operator" responding to the first digit of the number wanted.

A "final" or "connector junction" which ends in relays which control the "relay operator," and cut off the latter when the connection is completed.

A "secondary link" which contains the battery feed for the called subscriber's telephone, the ringing generator and busy signal.

A "primary link" which with the "secondary link" connects the "final junction" with the line called. (The "primary link" is used in common for either an incoming or an outgoing call.)

A "relay operator" associated with the "final junction" responds to the last two digits of the called number, and causes to be joined together the "final junction" and the "secondary link," and the latter to the subscriber's line by the "primary link."

The "relay operator" consists mainly of two parts, viz., a relay unit or selector to build up a circuit corresponding to the number of impulses sent, so as to complete circuits through particular wires and apparatus which relate to the line being called, and a searcher or tester which puts the engaged lines into such a condition that a line calling them cannot be connected, but remains open at a relay of the "primary link," a busy signal then being given to the calling party. When the called line is idle, initial energising impulses are sent by the "relay operator" which actuate relays to join the line circuit through; a second circuit on these relays forms a locking circuit to hold them energised, and cuts the line relay out of circuit.

The impulse sender at the subscriber's office may consist of a dial, or of a series of levers which are set to the number required before the receiver is lifted to send in the train of impulses. The combination requires that one wire be "earthed" during the impulses of a digit and opened between digits, the impulses being sent over the other wire.

Fig. 5 shows in skeleton a portion of a Betulander relay exchange, with symbols for the various relays and groups of relays; the thick lines show the course of operations when subscriber No. 1 calls subscriber No. 93 on a 100-line system.

On subscriber No. 1 taking his telephone off the rest, the line relay A associated with his line will operate and start the "outgoing searcher" X. The purpose of this "outgoing searcher" is to search out an idle outgoing junction and then to effect a connection between the calling subscriber's line and the idle outgoing junction thus found.

The searcher relays *x* having determined that No. 3 outgoing junction is idle, operate No. 1 subscriber's cut-off relay B and also the two connecting relays C and D on "link No. 2" corresponding with No. 1 subscriber and No. 3 out-going junction. The "outgoing searcher" does this work almost instantaneously, and then drops out of circuit and is ready for another call.

Subscriber No. 1 is now extended *via* relays A, B, C, D, and the selector relay *y* to the "tens and unit selector" Y.

The foregoing operations have taken place following on

the removal of No. 1 telephone from the rest, and before the impulses are sent. The tens and units impulses are now received by the "selector" Y, and as it is No. 93 that is being called for, 10 tens and 4 units impulses will be received.

The 10 tens impulses will result in the 90-99 marking circuit being chosen by the selector, and the four units impulses will provide for the fourth subscriber in that ten, which is being marked as ready for connection with an idle incoming junction.

The "incoming searcher" Z now comes into operation and *via* relays *z* searches out an idle incoming junction, in this case No. 5.

The connecting relay E at the point where outgoing junction No. 3 and incoming junction No. 5 cross now operates, also the two connecting relays F and C′ on "link No. 3" corresponding with incoming junction No. 5 and subscriber No. 93, also the cut-off relay B′, while the selector Y and incoming searcher Z drop out of circuit and are ready for other calls.

It will be seen that subscriber No. 1 is now connected to subscriber No. 93 by five connecting relays—namely, C, D, E, F and C′.

Ringing is now automatically applied to the called line for operating the bell, and on the called subscriber answering, a standard talking circuit connects the two subscribers.

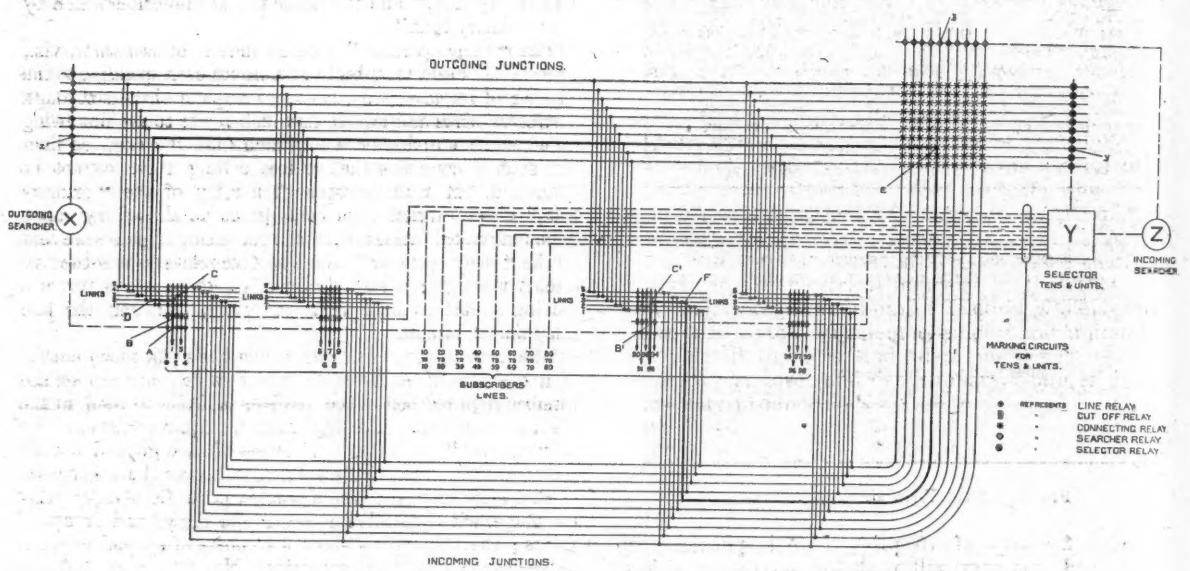


Fig. 5.—Diagram showing the Course of a Call through the Exchange.

If No. 93 had been engaged, No. 1 would have received the busy-back in the usual way.

The following advantages are claimed for the system :—

1. The exchange switching apparatus consists entirely of relays.

2. Relays are practically frictionless, and there is, therefore, little wear.

3. Being compact in form, relays are conveniently covered in small units by dust covers, which give ready access to small portions of the plant at a time.

4. Relay covers can be made dust and damp-proof.

5. Relays being of small movement and direct acting, are the simplest possible apparatus for doing circuit-changing and switching work.

6. Relay adjustments do not alter readily, and experience in central-battery exchanges proves that once they have "settled down" they give little trouble.

7. Relays being largely used in all central-battery telephone systems, most administrations would have a staff ready trained in the maintenance of relays.

In conclusion, we must congratulate the Betulander Automatic Telephone Co. on having secured an invention of the first importance in the sphere of telephony ; and we wish to thank Mr. Clay and Mr. Williamson, joint managers, and their assistant, Mr. Bryant, for the patience and pains with which they initiated us into the working of this wonderfully clever system.

THE ORGANISATION OF THE ELECTRICAL INDUSTRY.

By C. ASHMORE BAKER.

We of the electrical fraternity are now widely discussing a question, or rather, group of questions, which must some day, somehow be settled, and which in the ordinary course of events would be settled by the familiar, but expensive, process of trial and error, especially error.

There is no reason, however, why we should not make some attempt to apply a more scientific method to our development, and thereby avoid some of the "heat losses" incidental to the method of "blind staggers."

Our problem is to correlate the various interests involved in the electrical industry so that they will intermesh with a minimum of friction while reserving to our system sufficient elasticity and mutability to enable us to meet, and adapt ourselves to, such temporary stresses and evolutionary changes as the times may produce.

What in the first place are the interests involved? We have :—

I. The capitalist, who as mortgagee, debenture holder, &c., is the real owner of the means of production and use of electricity and electrical appliances.
II. The manufacturer.
III. The contractor.
IV. The expert adviser.
V. The technical engineer.
VI. The operative worker.
VII. The consumer.

This general classification is crude and requires further analysis and examination.

In the first place all these categories merge into one another, and it is impossible to draw a sharp dividing line between the limits of any two. Roughly speaking, however, they are, at the present day, true categories with perhaps the exception of class IV, which requires further subdivision. Thus we have in class IV (*a*) the consultant, the temporary adviser to any person or group from another category who may for any time or purpose be classifiable as a consumer.

The consultant is now beginning to differentiate

himself as a member of the Association of Consulting Engineers.

Then we have class IV (*b*), the chief engineer (municipal or commercial), who performs the functions of class (*a*) but is, so to speak, "permanently attached to his host."

Here again we find further subdivision necessary, since we have supply engineers (municipal and company) and chief engineers of manufacturing and contracting houses.

Thence downwards we have in class V the host of assistant engineers, merging by insensible gradations into class VI, foremen, mechanics, wiremen, &c., down to the primordial voltmeter boy, all of whom must be classed economically as workers, notwithstanding wide differences of pay and capacity, inasmuch as they are not technically responsible, their work being under the control of expert chiefs.

Here again, economic differentiation is beginning to take place, at present tentatively and from below upwards, thus we have various engineering societies, trade unions, &c.

Finally, in class VII the consumer, totally unorganized, in fact "sans eyes, sans ears, sans teeth, sans everything."

Now, what are we to make of this collection? Obviously the I.E.E. cannot as at present constituted receive them all under the shelter of its maternal wing. Were the attempt seriously to be made, the wing would run a serious risk of being blown to pieces.

The functions of any system of industrial coordination may be classified under two heads:—Scientific and Economic.

Now as regards the scientific functions, the I.E.E. might be made to fill the bill. The science of our industry touches all of us, and there is no reason why all categories should not function equally upon this plane.

True there is some confusion of thought exhibited at times as to where science ends and economics begin, as when, for instance, some enterprising gentleman from, say, class IV (*b*) comes to Westminster and reads a chapter or two from his firm's catalogue to the horror and scandal of professors and consultants alike.

Now, I am not objecting in any sort of way to tasteful and informative advertisement, which is, as a matter of fact, a function indispensable to organic life, and there is no reason whatever why it should be confined to the poppy and the pole-cat.

Nor can it be suggested that economic science *per se* (or any other science for that matter) should be excluded from our consideration.

I am of the opinion of a well-known engineer, who was defending the ubiquity of his range of action to a still more famous politician. Quoth the latter: "Should you consider the saving of souls within the province of the engineer?" "It is our business to save everything we can," was the prompt and gallant reply.

Nor do I suggest that discussion, frank open discussion on a common platform of the relative economic interests of the different categories should be debarred at our meetings. Such discussions may well be proper to, or have a bearing on, both electrical and economic science.

But here we must draw a line. The Institution should not be an organ of any interest in particular, should not become involved in the cogs of any political machine, should on no account lend itself as a body to backstairs influence or intrigue of any nature whatsoever.

The record of the whole of its functions should be available to the whole of its members.

Let the members sectionalize as much as they please, let the physicists, the technologists, the business managers, and such groups as the "point fives," the Rontgen Society, the illuminating engineers, and charge engineers, wiremen, fitters, find hospitality beneath its roof for their particular sections in so far as these sections require to discuss their affairs among themselves, and let the general meetings and general membership be open and equal to every member of every branch and every class. But, let no official, or committee of the Institution, as such take part in any dispute or discussion between categories having conflicting economic interests except in so far as to act as arbitrator in disputes, and then only at the free invitation of both disputants.

Thus stability of organization on the scientific plane lies as I have suggested in the direction of integration, of extending as widely as possible the basis of membership of the I.E.E. as the central institution, while leaving individual members, or groups of members, to specialize as much as they please.

On the other hand, stability on the economic plane will, I submit, be promoted by the opposite type of development, namely, by well-defined differentiation between interest and interest.

Thus we see a strong and healthy tendency towards economic differentiation in the formation of such bodies as the B.E.A.M.A., the Contractors' Association, and the Association of Consulting Engineers, not to mention various trade unions.

Now these associations are by their very nature mutually antagonistic from the economic point of view. We might perhaps roughly subdivide them as employers and employed, but even so the classification is at present only relative as the employer of one class may be the employed of another, *e.g.*, the consultant.

A very large number of men in the industry are not organized at all. Thus there are numerous assistant engineers, draughtsmen, departmental managers, &c., &c., to whom no economic organization is available.

Now, if economic science teaches us anything at all, it teaches us that an unorganized or ill-organized industry is a weak industry. Our strongest and most successful trades are those which are most strongly organized both on the employers' and the employed side:—cotton, coal, steel work, &c. While those which are least successful in the markets of the world, those which cry loudest for "protection," those in which sweating is most rife, are the trades in which organization is absent or undeveloped.

It is not sufficient from the employer's point of view that he and his brother employers should be knit together in a close sodality. He must have well organized trade unions among his men to act as anvil to his hammer and prevent the evils of the wage-sweating rival, or the unauthorized strike and the hopeless task of trying to control a rabble instead of an army.

To the member of the employed classes also it is necessary that his own unions should have rigidly organized employers' leagues to re-act upon, the memberships of which should be as complete and universal as it is possible to make them. It is just as important for the trade unionist (of whatever class) that there should be no blackleg employers as that there should be no blackleg workmen. If the two interests can meet on the level, they are much more likely to part on the square.

These things are beginning to be realized by the more intelligent men on both sides, and it behoves us as members of the electrical industry as a whole to see that our economic units are differentiated as quickly *and as isomorphically* as possible into their proper tissues. You cannot build good sinew and muscle out of liver cells, while a horny brain would be less useful than a sick headache.

Therefore let the various industrial and professional associations be expanded and strengthened, the trade unions extended to include as far as possible all capable men, and, above all, let a new body, or bodies, be formed to include all those en-

gaged in the profession to whom existing unions are not available.

Thus there are two lines of action which must be followed if our industry is to be re-vitalized. First, we must broaden the areas of mutual contact on the scientific side, so that such knowledge as we possess may be diffused as widely as possible. Secondly, we must differentiate like economic interests into separate crystalline groups, having the I.E.E. as a sort of mother liquor, a medium for the exchange of energy and the promotion of general balance throughout the industry.

Now, just a word about that consumer. He is at present, as I have said, little more than a cipher, but he is gradually transferring himself by a sort of economic osmosis from category VII to category I, and is destined, I anticipate, to become the significant figure. Those of us who possess any economic value will not, I think, be seriously disturbed by his apotheosis, and I for one should not hold up my hands in horror at the thought of his transformation.

In good American, I am "some consumer" myself.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Training of the Instrument Maker.

I wish to encroach on your valuable space to make a few remarks on the letter of Mr. R. W. Paul *re* the dearth of high-class instrument makers and some of the causes. In the main the dearth may be attributed to two special causes :—

1. The elimination of the chamber master.
2. The introduction of machine operations.

Dealing with the first, most of the good old instrument makers, those whom Mr. Paul mentions as being proud of their handicraft, were mostly trained in the small shops, and knew how to carry a job right through, from making tools, templates, patterns, brazing, silver soldering and, in fact, anything and everything appertaining to the production of any piece of high-class work, without supervision.

Now all these items are specialised, and a lad has no chance whatever of obtaining the knowledge necessary to these operations.

Suppose, as Mr. Paul suggests, that the Continental system of trade schools is adopted by the L.C.C., of what avail is the knowledge acquired under our present factory system ? The old chamber masters and their connections have long been absorbed in the huge companies now in vogue, and operations are brought down to infinity with all its soul-destroying monotony.

I must here digress a little to apologise for length of reply, as this is a momentous question ; it wants fairly well dealing with, and I am trying to be brief.

We will now deal with the second cause, viz., introduction of machine operations.

Before this came into vogue, men were shamefully betrayed. Let me explain : a clever mechanic is picked out for a certain job, say it is competitive, he is asked to do his utmost to produce this job as economically as possible, he gets to work and devises many ingenious rigs, &c., to do the job ; what is the result ? All his endeavours are of no avail as far as he is concerned, as all the clever devices he has made are used against him to reduce the price to him and bring him down to a mediocrity, and he gets no more pay than the man who uses his clever tools and ideas ; this causes much discontent and antagonism.

As a workman and foreman of 40 years' experience, I have watched all these points intently, and do know for a certainty that a good sound technical workman is not required as a foreman, but a bully wholly incompetent ; all that is required of him is output ; a man who understands his business rarely stoops to the dirty tricks that are witnessed daily in our shops ; there are others but few and far between. I feel truly sorry to see lads in our modern shops on a fairly dead end job, it takes all initiative out of them even if they had any, and they see the highly skilled man thought very little of in the fierce struggle for huge profits.

The selection of lads for instrument makers is not fair, many are thrust into it without inquiry as to their fitness ; in days past most had a very great aptitude for the work, these are the men Mr. Paul deplores the dearth of.

The pay, too, is wholly inadequate for high-class work.

Considering the time and study a man has to spend to acquire his knowledge, the pay is poor ; in any other walk of life amongst artisans there is no trade so complex as that of an all-round scientific instrument maker ; and, candidly speaking, his pay is far from what it ought to be, no matter what his skill be, and, in fact, all producers are brought down to the lowest level of subsistence.

Scientific Instrument.

Electricity Supply in London.

In your leading article of 3rd inst., you compare company and local authority undertakings in London and conclude that the companies are endowed with a double dose of original sin. Now there is no particular reason to suppose that the directors of companies would deliberately employ less competent people to work their business than local authorities, and, therefore, presumably there is some other reason for the results you mention. You give two—insecurity of tenure and early pioneering expenditure. If the difference in the charges on capital, *i.e.*, interest and dividends and depreciation or repayment of loans be taken as a measure of these and be deducted, we get a difference between companies and local authorities of ·21d. instead of ·61d. per unit overall. But the higher rate of interest required by companies carries, as a consequence, increased rates and taxes, and if these also be deducted the ·21d. is further reduced to ·14d. Even on the basis of an average overall price, things do not look quite so black for the companies as at the first glance.

But unless the supply of current for different purposes is in approximately the same proportion, a comparison on the unit basis is not altogether an accurate way of stating the case.

The actual units sold per consumer for private lighting in 1911-12 were almost identical—934 for local authorities, 928 for companies, but in addition the local authorities sold 1,120 units for power and 330 for street lighting per consumer, against 661 and 44 for the companies. If, in the case of the companies, the units sold for street lighting, power and traction had borne the same proportion to those sold for private lighting, as they did in the case of local authorities, it would, of course, have greatly reduced the companies' average price, because these units are the cheapest to supply, and are sold at a much lower rate.

The reasons for the difference in the proportions are fairly obvious. Local authority undertakings are situated generally in better districts for power than are companies, and where the Borough Councils own the supply undertaking they are willing to take more current themselves, both for ordinary lighting and for lighting the streets than where the undertaking is owned by a company. Moreover, they are willing to pay a higher price for it.

Let me give you another, and, I think, a fairer comparison. If either the units sold by the local authority undertakings be worked out at the companies' rates, or the companies' sales at the local authorities' rates, the difference between the two classes of undertaking is less than the difference in capital charges mentioned above. It seems fair, therefore, to say that, given equal conditions, the companies in London would certainly not be behind the local authorities. After all, this is only what one would expect, and it does not in the least detract from the good work being done by the local authorities.

I am not arguing that everything is perfect. Prices would certainly have been lower to-day had it not been for the policy forced on the companies by Parliament. The effect of the purchase clause is that consumers have to pay

extra in order that the ratepayers of the future may be able to purchase the undertakings below their fair market value, while the non-association clause prevents combination to reduce expenses. Nevertheless, improvements in method and reductions in price are being made constantly, and will continue.

What I am concerned about, however, is to show that it is not correct to tell the consumer that "the companies stand between him and a cheap supply of electricity," as some interested parties are so fond of proclaiming.

L. H. Hordern, *Manager,*
Westminster Electric Supply Corporation, Ltd.

London, S.W., *July 6th*, 1914.

Zero Resistivity.

There has been published lately a report of an experiment proving that lead when cooled to a very low temperature holds an electric charge.

Further particulars of this would be most interesting, either through your columns, or by reference to some authority of note.

It occurs to me that it is not at all unlikely that most, or at least many other substances, behave in this manner. Should air be one, then have we not a better explanation of the Aurora Borealis than that of Franklin, viz., that the cold air being warmed loses its charge in the form of a brush discharge?

Alec T. Scott, M.I.E.

London, N.W., *July 6th*, 1914.

[We would refer our correspondent to the note headed "Zero Resistivity," on page 16 of our last issue.—EDS. ELEC. REV.]

Concerning Switchgear.

With reference to the above article published in last week's REVIEW, we are, as a firm of insulating material manufacturers, particularly interested in all such questions, and we trust that you will therefore publish our remarks in your next issue.

We are in entire agreement with the author's adverse criticism of fibre when used in electrical apparatus where high insulation is essential. It seems to us that the question which will naturally arise in the minds of your readers is whether there is any substitute which might be used, and which, while possessing all the mechanical properties of fibre, will also have higher electrical properties.

We are large suppliers of fibre, but we also manufacture many other insulating materials. We are now manufacturing a new insulation, which we term high-grade paxolin, and which would be perfectly suitable for all switchgear work. High grade paxolin is built up of layers of paper impregnated with Bakelite varnish, this varnish being a condensation product of phenol and formaldehyde. The material has even greater mechanical strength and thermal properties than fibre, has a dielectric strength of not less than 500 volts per mil of thickness, is absolutely non-hygroscopic and will not warp, twist or lose its shape under any conditions whatsoever. It can be drilled, tapped, sawn, turned, and planed by ordinary machining methods. It is non-inflammable, but will eventually support combustion if brought into contact with a flame for any length of time. The guarantees as regards heating are that this material will withstand safely temperatures up to 150° C.

The great advantage of using fibre is its low cost and the easy manner in which it can be worked. Our high grade paxolin is more expensive than fibre for the thin sheets, but whereas fibre is difficult to obtain in thicknesses over 2 in. there is no limit to the thickness in which high grade paxolin can be supplied, and for thick sheets the cost of high grade paxolin is lower than that of fibre. The weight per cubic inch is slightly less than that of fibre, and consequently the small pieces which are used in the manufacture of switchgear would not increase the cost of this apparatus to any appreciable extent.

A consideration of the above properties will commend this insulating material to all electrical engineers, and if, as Mr. Lees so strongly recommends, fibre be eliminated from all switchgear, then it would appear that high grade paxolin would be a most desirable substitute. It would certainly enable manufacturers of switchgear to fulfil readily the new Home Office Rules and Regulations governing the use of electrical energy for industrial purposes. The material can also be supplied in the form of tubes and bushes and other special forms, and it is particularly suitable for oil-immersed apparatus, and is unaffected by weak acids.

The Micanite and Insulators Co., Ltd.
M. MOHR, *Secretary and Manager.*

Walthamstow, E., *July 6th*, 1914.

LEGAL.

ILFORD GAS CO. *v.* ILFORD URBAN DISTRICT COUNCIL.

IN the Chancery Division on Friday, July 3rd, Mr. Justice Sargant had again before him the motion in the action of the Attorney-General at the relation of the Ilford Gas Co. *v.* The Urban District Council of Ilford, by which the plaintiffs sought an interim injunction to restrain the defendants from carrying on the business of suppliers of electric energy *ultra vires*.

MR. MARK ROMER, K.C., who represented the plaintiffs, said it was a double-barrelled motion. It sought, first of all, to restrain the defendants from acting *ultra vires* in carrying on the business of supplying electric light fittings, and so far as regarded that branch of the notice of motion the defendants had given an undertaking not to enter into any fresh contracts at all, and the undertaking, he understood, they were willing to continue. With regard to the second branch of the notice of motion, the plaintiffs asked for an injunction until the trial or further order to restrain the defendants from preferring one class of consumer to another unlawfully. The particular preference in this case was a different scale of charges for the consumer who used only electricity as against the consumer who used both gas and electric light. In December last the defendants' counsel formulated an additional scale which was to apply only to premises electrically lighted throughout. In other words, they proposed to discriminate between those who took all of their light from the defendants, and that was a discrimination that was clearly referred to as *ultra vires* by his Lordship in his decision in the Long Eaton case, whatever view might be taken on the different points that might arise in this case. A certain amount of evidence had been filed in the present motion which was not evidence at all of a technical character, and he did not understand that the defendants were attempting to justify this discrimination. It appeared to him that it was more a matter of argument than anything else, and, under the circumstances, he was not sure what course the defendants proposed to take.

MR. MARTELLI, K.C., for the defendants, said that the position they took up was that this was really a case for an early trial, but he appreciated that that would be difficult at this time of year. He submitted that matters should be allowed to remain as they were until the action could be fought out.

MR. JUSTICE SARGANT asked when this new scale of charges came in force.

MR. MARTELLI said in January of the present year.

MR. JUSTICE SARGANT: Are the accounts half-yearly?

MR. MARTELLI: No, quarterly.

With regard to the supply of electric fittings, he said the defendants were quite prepared to continue the undertaking they had given, and with regard to the alleged undue preference, he should submit that such preference was not within the decision of the Long Eaton case. The question was whether on the evidence as it stood, and on an interlocutory motion the Court would grant an injunction. The defendants proposed to give a new scale when there was part electric and part other lighting, and the evidence they had filed showed that those who took the electric supply for the whole of their lighting were much better customers than those who lighted only partly by electricity. Take, for instance, the public-houses in the district that were lighted wholly by electricity. Many were lighted partly by electricity and partly by gas, and then there was no certainty of the constancy of the supply. Again, in the case of shops, the consumer who had both his shop and residence lighted by electricity was a much better customer than the consumer who took the electricity for lighting his shop and lighted his residence with gas.

MR. JUSTICE SARGANT: What are you proposing to do? Raise your rate to those who do not take wholly an electric supply?

MR. MARTELLI said no. They had six or seven different scales.

MR. ROMER: And there used to be a flat rate?

MR. MARTELLI: And there is now.

MR. JUSTICE SARGANT: So the damage done will be that those who use both forms of light will have competitors trading on more favourable terms?

MR. MARTELLI: Yes.

MR. JUSTICE SARGANT said the question before him was whether the case should be argued then upon motion, or should go for trial. As the plaintiffs were not seeking to restrain an extra charge made to a certain class of consumers, but were seeking to restrain the defendants from giving facilities to others for trading on more favourable terms, he did not think it was a case which he ought to try upon interlocutory motion.

MR. MARTELLI said one of their new rates was merely to explain to consumers what they did not understand in the old rates. The rate was the same, but was couched in different language.

MR. ROMER: My learned friend says his consumers don't understand a maximum demand, and therefore it is better to have a simpler rate.

MR. JUSTICE SARGENT said the case could be tried early next sittings. Was the existing undertaking to continue?

MR. ROMER: The undertaking as to the further supply of fittings undoubtedly.

MR. MARTELLI said the defendants would certainly continue that undertaking.

MR. JUSTICE SARGANT said that pleadings could be delivered before the long vacation, there could be mutual discovery, and the case could then be tried early next sittings. He would accordingly make no order on the motion except that the costs should be costs in the action.

S. BUCKLEY & SONS *v.* BUCKLEY & TAYLOR, LTD.

AT Oldham County Court, on July 2nd, Samuel Buckley & Sons, of Oldham, brought an action against Buckley & Taylor, Ltd., engineers, of Oldham, to recover £17 14s. 7d., damages sustained in consequence of the defendants negligently and unskilfully turning up a commutator belonging to the plaintiffs.

MR. CLARK (for the plaintiffs) said that in October last his clients sent the armature and commutator of a 10-H.P. electric motor to the defendants' works to have the commutator re-turned. In carrying out the work the defendants reduced the soldering of the ends of the insulating wires from $\frac{1}{8}$ to $\frac{1}{16}$ of an inch by turning too close to the ends of the armature windings. The motor, in consequence, ran unsatisfactorily afterwards, and 10 days later broke down entirely owing to the wires leaving the sockets. Experts called in by the plaintiffs were agreed that the motor had been rendered useless, and that the armature must be re-wound. The British Thomson-Houston Co. re-wound it at a cost of £6 15s. Plaintiffs had suffered loss of production, and had also had to defray the cost of sending yarn elsewhere to be wound.

Evidence bearing out the opening statement was given by J. H. Buckley, a member of the plaintiff firm; P. Barnes, electrical inspector to the Vulcan Insurance Co. (who said the commutator was turned off the whole length up to $\frac{1}{32}$ of an inch of the ends of the windings, leaving them unstable); P. Skipworth, an electrician; S. Charlesworth, the latter's employer; and Mr. Chamberlain, mains superintendent of the Corporation, who attended on subpœna. The last witness said the injury to the commutator was caused by the lathe tool being carried through the top side of the wires in the commutator bars.

MR. H. TAYLOR, manager for the defendants, said that in turning the bars they ran up to the "shoulder" only, and did not cut the ends of the wires at all.

Evidence corroborating this was given by H. TAYLOR (foreman) and J. TYAS, who carried out the work.

MR. BAXTER, foreman electrician employed by the Manchester Corporation, said that even supposing that the wires had been cut down to the extent alleged, it would not be necessary to have the armature rewound. The sixteenth of an inch wire which was left, was quite sufficient to do the work required of it.

JUDGE SPENCER HOGG said that on the evidence, he must find that there was negligence, and, therefore, plaintiffs were entitled to recover. They were not, however, entitled to recover for loss of business, and judgment would therefore be for the plaintiffs for £14 15s. 3d. and costs, and certificate for two expert witnesses and photographs produced.

ROBIN ELECTRIC LAMP CO. *v.* B.T.H. CO., LTD., AND SIEMENS BROS. & CO., LTD.

[*Tungsten Wire Patent: Petition for Compulsory Licence.*]

IN the Chancery Division on Monday, Mr. Justice Warrington heard an application by Robin Electric Lamp Co., Ltd., for particulars of the grounds of opposition to a petition by that company for the grant of a compulsory licence. The respondents to the application were the British Thomson-Houston Co., Ltd., and Siemens Bros. & Co, Ltd.

Mr. Cave, K.C., M.P., and Mr. Frost appeared for the applicants and petitioners; Mr. Walter, K.C., and Mr. J. H. Gray for the British Thomson-Houston, Ltd.; and Mr. Colefax, K.C., and Mr. Hume for Messrs. Siemens.

MR. CAVE said the petitioners were the makers of the Robin electric lamp, for which they held a patent. For the manufacture of that lamp they required to use a filament of drawn tungsten wire. The respondents, the British Thomson-Houston, Ltd., and Siemens Bros. & Co., Ltd., owned a number of patents for the manufacture of that particular wire; six were held by one respondent and three by the other. They had granted licences not to manufacture the wire, but to manufacture different lamps fitted with the wire; and they and their licensees had formed themselves into an association called the Tungsten Lamp Association, and by the terms under which they were united they fixed the price of the lamp and prevented the sale under a certain price, so that they sought to obtain a monopoly practically of the lamps fitted with this particular wire. The petitioners desired to use the wire, not of course to manufacture the lamps which the other people made, but to make their own lamps, and for that purpose to have the use of the patented wire. The petitioners did not desire to lay themselves open to any sort of action for infringement. They had applied to the respondents and to their licensees for a supply of the wire in question. All but one declined to supply it. One of the respondents, the British Thomson-Houston, Ltd., had offered to supply the wire to the petitioners at the price of 125s. per 1,000 ft. One point at the hearing of the petition would be whether that was not a wholly unreasonable price, and the evidence so far as the petitioners had got it was that they could buy abroad at 40s. per 1,000 ft. instead of 125s. Their evidence was that 125s. was an unreasonable price, and that they could not profitably make their lamp unless they could get a wire at a reasonable price. Their petition was for the grant of a licence to make the wire on reasonable terms. The respondents opposed the petition on the ground that the reasonable requirements of the public were already satisfied, and that they had granted licences on reasonable terms to manufacture and sell the patented article. The petitioners asked for particulars of the licences and the terms, and unless they had these particulars they would not be ready at the trial to prove that the licence had been granted on reasonable terms. Therefore they asked for particulars as to the licences granted, as to the alleged provision already made for a supply to the public, and as to the manufacturers who already supplied the lamps.

MR. WALTER, for the British Thomson-Houston Co., said he had never before heard of any such petition as this. It did not define for which one of the nine separate inventions the petitioners wanted a licence. They applied for a general licence in respect of nine patents, without saying which invention did not satisfy the reasonable requirements of the public. Before the petitioners had established a *prima facie* case to the Court, they asked that the respondents should give the particulars they wanted. They alleged that they were to set up as rivals, and they asked for particulars of the private business transactions and bargains between the respondents and the Osram Lamp Co., one of the licensees, and others.

His LORDSHIP said they did not ask for a roving inquiry.

MR. GRAY, also for the British Thomson-Houston Co., said the petitioners were not entitled to the particulars they asked in reference to a document that was not before the Court.

MR. COLEFAX, for Siemens Bros. & Co., Ltd., associated himself with Mr. Gray's argument, and deprecated incurring danger to trade by giving the particulars asked.

His LORDSHIP said this was no doubt a very important application, and if his decision had been the reverse of that which it was going to be, he would have reserved his judgment. By the Section of the Patents Act, 1907, under which the application was made, the onus was thrown on the petitioner to prove to the satisfaction of the Court that the reasonable requirements of the public with reference to the patented invention had not been satisfied. It seemed to him that the rules regulating procedure in these matters provided for optional delivery on the grounds of opposition — if the patentee chose to deliver them for the information of the Board of Trade, and for no other reason whatever. The petitioners here complained, among other things, that the patentees had made default in granting a licence on reasonable terms. If he were right, a complete answer to the application was that the ground of opposition was not a written proceeding requiring particulars at all. The ground of opposition was not a proceeding for the purposes of the rules of the Supreme Court. It was never properly before the Court at all. What the Court had to deal with was the petition. It would be extremely hard upon a patentee and other persons working a patent under him if he were to be required, before the petitioner had proved his case to the Court, to give such information as that which was asked for by these particulars. For these reasons his Lordship must refuse the application for particulars, and the costs of the application would be the respondents' in any event.

On the application of MR CAVE,

His LORDSHIP gave leave to appeal if he could appeal.

MARCONI AND MARCONI'S WIRELESS TELEGRAPH CO., LTD., *v.* HELSBY WIRELESS TELEGRAPH CO., LTD.

(*Continued from page* 8.)

Continuing the examination of Mr. Pletts, MR. GRAY said: I think you tested the coupling. What was the result of your test? —I reproduced the circuit. I did actually measure the coupling; and I made several variations to see how big it could be made; and I was convinced that it must have been certainly under 5 per cent.

How many waves do you think, from your calculations, the defendants got in their primary from one charging?—It is a very difficult thing to say. If one is dealing with the quenching point, the number of waves in the primary must be at least between 20 and 25 before the energy is handed over to the other circuit, and the primary can be stopped.

You inspected the apparatus and tested it; what do you estimate is the number of waves, assuming there is damping?—I think, if the damping were such as is shown by the curves, then there would be extremely little energy put into the aerial. There would probably not be a large number of swings. I can put it more clearly in this way. If the damping is so great that there are only three or four effective swings, then the whole installation is most inefficient.

Would it be of any practical value where it was installed?—No, certainly not. You see that with these 2 per cent. couplings, only 2 per cent. of the energy is handed over each time. If you have six half waves and hand over 2 per cent., 12 per cent. of the total is the utmost which can be got out, and it is very much less than that, in fact.

MR. DUGALD CLERK was the next witness.

MR. HUNTER GRAY (to witness): You inspected the installation at Holyhead on board the *Cambria*; will you tell me what the result of your inspection was?—Mr. Swinburne and myself went with Mr. Pletts to the *Cambria* at Holyhead, and Mr. Chambers met us and explained the apparatus. It was at once obvious that there was an auto-transformer there, and that the mutual induction, the circuit common to both circuits, was small relative to the external induction. Without any calculation whatever we saw the big coil outside; that showed at once that there was loose coupling. We saw it work, and examined the spark gaps; they were very close together, like disks, with a flat surface; the object was obviously to damp, to cool the spark, if possible; there were other spark gaps which were adjustable. Mr. Pletts arranged his instrument for getting the wave length, and we tried it with various wave lengths.

What conclusion did you form as the result of your inspection?—My conclusion was that this was a Marconi instrument similar in essential respects to the installation on the *Nonsuch*, which I had studied before, and that the only difference I could see at the time was, while in the *Nonsuch* the transformer was a step-down transformer, in this it was a one-to-one transformer: that was the only difference, an auto-transformer. There was only one spark-gap in the *Nonsuch* arrangement; there were four spark-gaps here.

You heard Mr. Swinburne's evidence and Mr. Pletts'?—Yes.

Do you substantially agree with that?—I do, in so far as I understood it. Mr. Swinburne is a better electrician than I am.

MR. COURTNEY TERRELL (cross-examining): If you look at these gaps they are good solid blocks of copper; does that tend to conduct the heat away from the spark?—Yes, I believe that was the intention.

As far as the object of these gaps is concerned, it is the same as in Lodge?—Yes. Lodge's intention was to get his aerial charged rapidly by what he called the impulsive rush, and his notion was that the connection should be entirely cut off when charged between the induction coil and the Leyden jars, and that he would get a pure wave swinging in the aerial.

If you look at ours, if that spark goes out as quickly as possible, you get the aerial cut off from the capacity?—If you could do that, that is so, but then I understand as far as I have been able to follow it, and I believe it to be quite correct, you cannot get that spark out until you come to the period with less coupling. You must have that position between the two waves.

If you get the spark out as soon as possible, you get the aerial cut off from the primary circuit and the aerial oscillates in its own true wave?—That is quite so; if you cut it off very quickly as you suggest with a light coupling, you get a very small proportion of the condenser energy into the aerial.

Supposing you do find that the aerial with this decrement does go on for a good long wave train, then you have enough energy in it, have not you?—Yes, but you have not as much radiating energy as you could get in the case of the Marconi invention.

Supposing you tuned the secondary to the primary, you will get the energy through quicker, keeping the coupling exactly the same?—If you have loose coupling and tuning you get the energy through quicker, no doubt.

Therefore the primary oscillations will come to an end quicker?—Of course, on your hypothesis that you are taking the energy away quicker, that is so.

The Witness was cross-examined at some length with regard to the Oudin resonator, and the evidence for the plaintiffs was shortly afterwards concluded.

Opening the case for the defendants, MR. COURTNEY TERRELL said the action now resolved itself into a very simple and clear issue of fact, whether the defendants got the primary oscillating during the time that the secondary was sending out its waves. He thought he saw indications on the part of his friend Mr. Walter, went on Mr. Terrell, that he was preparing for a retreat. Whereas Mr. Walter had opened the case upon Mr. Justice Parker's construction of that patent, he was now going to retreat from that position and say it did not matter whether theirs was a quenched spark or not. He (counsel) did not know whether there would be any more litigation about this patent, but he would suggest that they should keep to the same construction as had been put upon it.

MR. JUSTICE EVE: Upon any question of construction I am bound by the judgment of Mr. Justice Parker?

COUNSEL: Yes, but if there is a question of any doubt, I suggest it will be resolved by the evidence given by Mr. Swinburne in the case.

It was somewhat curious that the defendants were licensed by the plaintiffs under Lodge in respect to the very system upon which the plaintiffs were now suing.

MR. WALTER dissented.

MR. TERRELL said his points were (1) that the defendants' apparatus was after Lodge, whether Mr. Swinburne was right or not; (2) that it was not Marconi's. Lastly, that Marconi, as a statement of a new manufacture was anticipated by the apparatus described in Tesla's paper of 1898, and by the apparatus described in connection with Ducretet and Oudin.

PROF. J. ERSKINE MURRAY, called for the defendants, examined by MR. JAFFE, said the electrical object of Mr. Marconi's invention was to radiate a slightly damped wave in order to obtain good selectivity, in order to make it possible for one station to communicate with a second station, while other communications were going on in the neighbourhood. There was a subsidiary object, and that was to put more energy into the aerial for each spark than could be put in by directly charging the aerial itself.

Marconi had made a previous invention in 1896?—Yes.

Did that attain the object?—No, the train was a very short one that was radiated from the vertical aerial with the spark gap in it, as the wave length was a very short one.

Was the defect of Marconi 1896 the same as Lodge had pointed out, that such a wave would affect any aerial that it came across, whether it was tuned to it or not?—Yes. Lodge solved the problem by using antennæ which had a low damping or a low decrement. Marconi took a good radiator, he coupled it loosely to a persistent oscillator; and instead of allowing his radiator to oscillate freely, he kept feeding it wave by wave with energy from the primary. He, therefore, obtained, radiated from the secondary, from the aerial, a somewhat similar train of waves to that radiated by Lodge. It was not absolutely similar, but somewhat similar, particularly as regarded the latter part of the train.

What is the difference between the two trains?—In the Marconi case the secondary wave train grows in amplitude rather slowly at the beginning. If Lodge charged his antennæ direct the amplitude of the radiated wave in his case would be the maximum at the beginning. If he used the primary circuit the amplitude of the waves radiated would grow in a somewhat similar manner to the Marconi case; but the growth would be more rapid and not continued so long.

In Marconi, 1900, the effect is a receiving aerial, with the same sort of waves, broadly speaking, as Lodge, but he caused his transmitting aerial to emit those waves by a different form of charging to Lodge, by the pat-pat effect on the transmitting aerial while it was transmitting?—Yes.

You have heard the theory of the Lodge system put forward by Mr. Swinburne. Will you please criticise that?—If, as Mr. Swinburne says, you have currents going out and in from the condensers of what I call the primary into the branches of the antennæ at a very high frequency, I cannot for the life of me see where the charging comes in at all, because practically as much will go out as comes in.

Will there be any energy left for the slower and active frequency, the telegraph train, through the inductance?—I do not see where the energy will come from; because if there are oscillations going to and fro in these high frequency circuits they will naturally leave a very minute charge when they are finished before these other oscillations are supposed to commence.

Supposing Mr. Swinburne's theory is a correct one, do you still get a short period of charging, and then a long period of radiation?—Most certainly you would.

Is that what the Helsby Co. do?—Certainly.

The only difference in effect between what Mr. Swinburne's theory would lead to and what you believe actually is the case, is that in Lodge-Swinburne, if I may call it so, the primary consists of very rapid oscillations; but for a very short space of time compared with the long train of secondary emitted waves which follows?—That is right.

What you believe represents Lodge-Helsby working, is the connection of a short primary and a very long secondary?—A short primary train of waves and a long secondary train of waves.

What is the best way of testing whether there is a short primary or a long primary?—There are two methods. The spark method, photography, or observations of the spark in a rotating mirror, is probably the most direct. The method of taking the resonance curve is very satisfactory, if you can be quite sure that you are getting your oscillation free from all interference by other oscillations.

MR. JUSTICE EVE: Can you check one method by the other?—You can.

MR. JAFFE: Is another interfering factor besides the antennæ the actual spark itself in the primary?—Most certainly. The form of the spark, or if you like to say so, of the spark gap, is absolutely essential, that is to say, it controls the decrement more than any other factor in the circuit, as circuits are ordinarily built.

I want to go into sundry matters connected with the coupling of the two circuits. I think the criticism was made by Mr. Pletts that the only time you could quench this spark was when all the energy had been transferred from the primary to the secondary, and I think it is agreed that that will take place at the half beat?—You must have your half beat from facts taken correctly, and not on the supposition that a highly quenched gap is acting like a continuous metallic circuit. Even if you assumed that a certain coupling needs a certain number of waves before the half beat, there is no reason why the effect of your gap and other arrangements, such as the Lodge three-charging coil, should not stop your primary long before that half beat without waves of energy, but simply with storage of energy in the primary, which will be used in the next spark.

Does the hissing spark appear in the defendants' apparatus?—One certainly hears the hissing.

Do you say that the three-charging coil has the effect, or has not the effect, while the oscillations are going on, of quenching?—"Arcing" would be entirely cut off by the Lodge three-charging coil.

That negatives Mr. Swinburne's idea that it is no use at all during the oscillation?—It does negative it.

I think you have already said the way the Helsby plant works is to stop the energy in a comparatively few swings?—Yes.

What is the effect of tuning in getting such energy as you do get across?—It increases the rapidity of the transference of the energy.

Do you agree with Mr. Pletts that the amount of energy transferred in each oscillation is directly proportional to the coupling?—No, I think the actual coupling is probably a variable function, but, as far as I know, the question has not been worked out in detail anywhere.

The Witness: May I point out that one way of obtaining quenching is to loosen the coupling, for the very obvious reason that if you have too close a coupling, the energy will go quickly into the antenna, more than it can radiate, and will, therefore, come back, and there will not be quenching. You must have certain couplings, and sometimes you have to increase and sometimes to loosen it. As a matter of fact, recent experiments show that there are a large number of optimi, best points for coupling—you can couple at 2 per cent., at 5 per cent., and at 9 per cent.; but in between it is bad.

What do you deduce as to the selectivity of the apparatus when worked according to the Helsby method and when the spark gaps are shorted?—The Helsby method is much more selective than the arrangement with the gaps shorted.

Have you the slightest doubt that in both the *Cambria* and the *Scotia* the primary oscillations came to an end almost before the secondary came to an end?—I have no doubt whatever that that is the case, and that the effective wave emitted by the secondary is a free wave.

(*To be continued.*)

COAL-HANDLING PLANT AT SOUTHEND-ON-SEA.

In our issue of May 15th, page 813, we illustrated and described the new Niclausse boiler plant which has been installed at the Southend-on Sea electricity works. A modern coal-handling plant has also been installed to serve the complete range of five boilers, and supersede the hand trimming formerly practised. This has been supplied by Messrs. Edward Bennis & Co., whose accepted scheme included overhead coal storage bunkers, for 500 tons of coal, and a bucket elevator and distributing conveyor.

The coal is brought up in carts or trucks and dumped into a receiving hopper below the ground level outside the boiler house, falling by gravity from this hopper into the elevator through a Bennis rotary safety feeder, which ensures a regular supply of coal to the buckets, and at the same time prevents any sudden rush of coal which would choke the elevator.

The elevator, about 70 ft. long, will raise the coal at the rate of 20 tons per hour, and is driven by a separate electric motor and is entirely enclosed. The full buckets and empty buckets are encased in separate trunks, the elevator being practically dust-proof. The whole of the gearing and shoots, &c., are carried on the elevator framework, thus avoiding the necessity for any external bearings or supports, and forming an entirely self-contained machine, neat in appearance and occupying a minimum of room.

The coal is delivered by the elevator into a Bennis U-link endless steel chain conveyor, from which it falls through openings into the bunkers beneath.

The conveyor, which is of 20 tons per hour capacity, is driven through substantial gearing by a separate motor, and access is obtained to all parts of the elevator and conveyor from a gangway carried on the same supports.

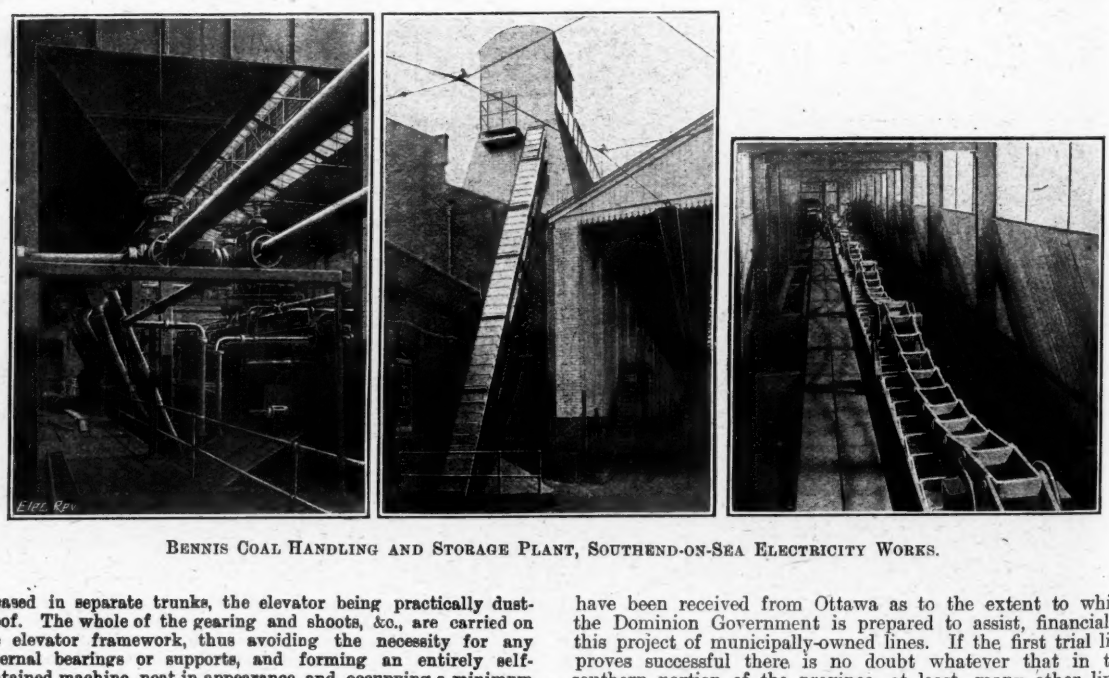
The bunkers form a series of rectangular bins with hoppered bottoms, having a number of openings, each opening being provided with an outlet shoot and radial cut-off valve operated by chains from the firing floor.

A swing shoot, with hoppered top and bell mouth delivery, is suspended beneath each outlet for guiding the coal from the bunkers to the stoker hoppers. These shoots are made to swing back out of the way when the boiler tubes are being cleaned.

The total length of the bunkers is about 106 ft., and they are carried on 12 stanchions resting on concrete pillars built level with the firing floor.

A superstructure is built on the top of the bunkers forming a conveyor chamber, extending the whole length of the bunkers.

The bunker sides were specially strengthened to sustain the weight of the roof, and special attachments were made for connecting the modified roof principals to the bunker, the stanchions having to sustain the weight of a considerable portion of the boiler house roof. The whole of the coal-handling plant and structural work connected with it was carried out by Messrs. Bennis.



Bennis Coal Handling and Storage Plant, Southend-on-Sea Electricity Works.

NOTES FROM CANADA.

[From our special correspondent.]

The Nova Scotia Tramways and Power Company is the name of a concern which has just been incorporated. Actual operations are promised within the next two years and the expenditure of at least $500,000 within four years. In this province (Nova Scotia), the town of Canso intends to put in a small electric lighting plant to be driven by a gas engine, and the Electric Tramway Co., of Halifax, N.S., proposes to put in a 2,000 kw. turbo-generator.

In Ontario, the Algoma Steel Corporation, in conjunction with the Michigan Northern Power Co., has just been granted rights to utilise water powers on the St. Mary's River at Sault Ste. Marie, 30,000 feet of water per second is allowed on each side of the river, the total amount being capable of furnishing some 100,000 h.p. The City of London (Ontario) has recently been authorised to spend $700,000 on the electrification of its existing steam railway which runs to Port Stanley; the Hydro-Electric Power Commission of Ontario is in charge of the work.

Readers of these "Notes" will be aware that the "H.E.P.C." has also been working on several proposed "radial" lines to be supplied with power from the Commission's transmission system; in connection with this matter various municipalities will vote on September 21st next as to whether actual construction of some of the lines is to be begun. It is anticipated that, by that date, some news will have been received from Ottawa as to the extent to which the Dominion Government is prepared to assist, financially, this project of municipally-owned lines. If the first trial line proves successful there is no doubt whatever that in the southern portion of the province, at least, many other lines will soon make their appearance and the already extensive operations of this Commission will be increased.

The H.E.P.C. has just let the contracts for the building of a large dam on the Beaver River, at Eugenia Falls, near Owen Sound, a town on the southern shore of Georgian Bay, about 110 miles N.W. of Toronto. The Ambursen Hydraulic Construction Co., of Montreal, were the successful tenderers for this dam which is to be 2,000 ft. long and from 40 to 50 ft. high. Tenders are being called for the plant, to develop 8,000 h.p., to supply the requirements of Owen Sound, Marlsdale,

Meaford, Thornbury, Wallserton, Chesley, Hanover, Mount Forest, Flesherton, Durham and Chatsworth. A plant on the Severn River until recently owned by the Simere Railway and Power Co., is said to have been purchased recently by the Commission, and this together with a power plant now under construction at Wasdell's Falls will be linked up with the Eugenia Falls plant so that each can help the other if required.

A duplicate line on the main 110,000-volt transmission system from Niagara Falls to Dundas is being erected, as is also the long extension from St. Thomas to Windsor, this being 100 miles long, the total distance from Niagara Falls being no less than about 220 miles, which would be about equivalent to London supplying Liverpool with power at home. When these works are finished the H.E.P.C. will be supplying power through about 3,000 miles of trunk lines (presumably wire miles) and several thousand miles of low-tension wires.

THE CHICAGO UNDERWRITERS' CODE.

IN our issue of June 19th we considered editorially the bearing of the National Electrical Code on our trade with Canada. We have now received from the Secretary of the B.E.A.M.A. the following copy of a letter on this subject which had been addressed to that Association by Mr. Dana Pierce, Electrical Engineer of the Underwriters' Laboratories, Inc. (Chicago), who, as already stated in our columns, has been on a visit to this country :—

COPY.

48, Westminster Palace Gardens,
Victoria Street, S.W.,
June 12th, 1914.

D. N. Dunlop, Esq.,
The British Electrical and Allied Manufacturers' Association,
Kingsway, W.C.

Dear Sir,—During the past few weeks I have had the pleasure of considering with you and with various members of your Association some of the questions which, for the past two years, have been discussed by British electrical manufacturers, with reference to the requirements of the National Electrical Code and the examination, test and approval of devices under that code by Underwriters' Laboratories. To British manufacturers these subjects have been of interest chiefly, if not wholly, as they concern goods of British make destined for the Canadian market. It is, therefore, from this point of view that I write to you with the thought that a brief review of the present situation, and a suggestion as to what appears to me a practicable and desirable development of it, may be of interest at this time to you and your members.

I desire first to express both for myself and for Underwriters' Laboratories, which I represent, my sincere appreciation of the fair and generous spirit with which I have been met, a spirit which should make it possible to continue with profit to all the discussion of the technical, engineering and business problems involved.

A year or more ago Messrs. Heap & Digby, of 48, Westminster Palace Gardens, Victoria Street, were appointed by Underwriters' Laboratories as its representatives and engineers in Great Britain. They have made for us the necessary examinations, tests and reports on a considerable number of British devices of different types upon the basis of which approvals have been given on the same terms as in the case of American makers. This work is being continued in response to further applications from other makers, and it has been found possible thus far, to arrive at conclusions satisfactory to all concerned even when changes in the products were required to bring them into conformity with American practice and rules.

That American practice in electrical installations and design of appliances is in many particulars different from British practice, is, of course, generally recognised. The requirements of the National Electrical Code have of necessity followed this practice and developed with it. Radical changes in practice cannot be expected, and are no more necessary nor desirable in Canada or the United States than they are in Great Britain. It, therefore, appears that British manufacturers must expect to adapt their wares to some extent to the special conditions existing in Canada, conditions not primarily created by the requirements of the Code or the work of Underwriters' Laboratories, but inherent in the electrical practice and habits of the country.

While this general principle is almost beyond question, it already is being proved by open discussion and a full and correct understanding of the conditions and the requirements between British manufacturers and the Laboratories, that the differences are less fundamental than they had appeared. The most salient difference in the method of judging appliances lies in the emphasis placed upon tests by Underwriters' Laboratories. The value of such tests as distinguished from a mere assumption that appliances are of a given quality or capacity has already been proven, and a more general practice of testing their own wares should be of the greatest assistance to British manufacturers.

The appointment of English representatives of Underwriters' Laboratories has, I believe, removed wholly the objection, quite properly made heretofore, that the difficulty of conducting the necessary discussions by correspondence with the laboratories in Chicago and the necessity of sending samples to New York or Chicago for test, placed British manufacturers at so great a disadvantage as almost to preclude their submitting their products. The results of this step have been highly satisfactory, and indicate how further progress may be made.

To undertake a general discussion of the entire National Electrical Code from the point of view of the British manufacturers is neither practicable nor useful. Neither we nor your Association can accomplish anything by such an effort. The problems are those of details not of generalities. Whenever an individual manufacturer or a group of manufacturers desires to discuss a specific topic or to submit a particular device, Underwriters' Laboratories, through its British engineers and its organisation in the United States, is desirous of working with your members in a common effort to uphold and improve the quality of electrical goods as affecting safety to property and life. The National Electrical Code grew from such efforts. The work of Underwriters' Laboratories has always depended upon the invaluable co-operation of manufacturers in developing and maintaining standards of construction and test.

In the work so far done by us in response to requests from British manufacturers for opinions on their goods for Canadian use we have already profited by such co-operation.

In conclusion, therefore, may I venture to express the opinion that further progress toward results desired by members of your Association will be attained by following a similar course, namely, to discuss each class of device by itself as occasion arises rather than attempt a general review of all at once, a method seldom productive of useful results in any field and peculiarly ill-suited to the problems of engineering.

I trust that, through you, we and our English representatives, Messrs. Heap & Digby, may have still further occasion and opportunity to consider the many and important questions in which we have a common interest.

With the most sincere expression of my appreciation of the courtesies extended to me during my visit to England, I have the honour to remain,

Yours very sincerely,
DANA PIERCE,
Electrical Engineer
of Underwriters' Laboratories, Inc.

BUSINESS NOTES.

Rubber Wires and Cables.—Prices Reduced.—THE INDIA-RUBBER, GUTTA-PERCHA AND TELEGRAPH WORKS CO., LTD., announce that owing to the fall in the market price of materials they are enabled to make a reduction in the prices of rubber-insulated wires and cables. Price lists No. 40, dated October, 1910, and No. 40A, dated September 1st, 1911, will accordingly be subject to altered discounts, of which particulars have been issued by circular.

MESSRS. SIEMENS BROS. & CO., LTD., of Woolwich, also announce reductions of prices in these manufactures, owing to the reduction in the market prices of materials.

MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., also announce reduction in the price of rubber-insulated wires and cables, with altered trade discounts for their May, 1913, list, and for their Henley wiring system list.

Patent Applications.—Applications have been made for the restoration of the following patents :—

C. E. Hunter, No. 27,196 of 1903, for "Improvements in electric switches."

Salamander Fire Bar and Smoke Preventer Co., Ltd. (applicants), No. 18,273 of 1906, for "Improvements in fire bars for steam boiler and other furnaces", and No. 10,432 of 1097, for "Improvements in furnace or fire bars," granted to G. A. Newton and J. Smalley.

London Railway Electrification Contracts.—In regard to the London and North-Western Railway switchgear contracts, to which we have recently made several references, the BRITISH THOMSON-HOUSTON CO., LTD., have secured the order for the main station switchgear for controlling the turbo-alternator plant in the railway company's new Wembley power station. The contract of the rotary converters has also been placed with the British Thomson-Houston Co., Ltd., who are supplying six 1,000-KW. and 25 750-KW. rotary converters which are to be used in the various sub-stations. In fact, the whole of the rotary converter plant for this electrification scheme is being supplied by the British Thomson-Houston Co., Ltd.

The London and South-Western Railway have placed with the same company an order for the whole of their rotary converter plant for their electrification scheme, which will consist of eight 1,000-KW. and 15 1,500-KW. rotary converters. The British Thomson-Houston Co., Ltd., have also the order for the main station switchgear for controlling the turbo-alternator plant in their Durnsford Road power station at Wimbledon, and, in addition, have the order for the whole of their sub-station switchgear.

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Exhibition at Mansfield.—The Mansfield Borough Electricity Department proposes to hold an electrical exhibition in the early autumn, and Mr. E. Holcombe Hewlett, the engineer, would be pleased to hear from firms or individuals willing to take part, either by exhibiting their manufactures, lending apparatus or giving demonstrations.

Bankruptcy Proceedings.—Before Judge Sturges, K.C., at Blackburn County Court, JOHN W. GARSDEN, an electrical engineer, of Hope Terrace, Dukes Brow, applied for his discharge from bankruptcy. He formerly carried on business as an electrical engineer at 24, Preston New Road, trading as J. W. Garsden & Co.

Mr. Plant, junr., on behalf of the Official Receiver, said debtor's liabilities were estimated at £5,038, and the trustee had admitted proofs amounting to £1,706. The difference between the estimated and actual liabilities was mainly due to the rejection of proofs, amounting to £3,279 on the separate estate, in respect of claims against a partnership of which debtor was a member. The assets were estimated to produce £953, but they had only realised £742. A first and final dividend of 6s. 2d. in the £ had been paid. Detailing the facts, Mr. Plant said about 1903 debtor purchased a partnership in the Hove Electrical Engineering Co. with £700 given to him by his father. The business was not successful, and at the end of 1909 the concern was turned into a limited company. This, however, was wound up in February, 1911. The company had a branch at Blackburn, and this was taken over by bankrupt for £155 for goodwill and stock, the money being guaranteed by his father. The business apparently paid debtor, who attributed his insolvency to a judgment for £1,183 obtained in June, 1912, by a lady who contended she had lent this sum to the partnership—a sum for which bankrupt never considered himself responsible. He had stated he was not insolvent until this judgment was obtained against him, but the Official Receiver was of opinion that he must have known he was insolvent, though he was not of the opinion that bankrupt contracted debts without having any reasonable hope of being able to pay them. Debtor had kept proper books of account, and he had to report that his assets were not of the value of 10s. in the £.

Mr. Haworth, on behalf of debtor, asked the Judge not to find that bankrupt continued to trade knowing he was insolvent. The Official Receiver's report itself hardly justified that conclusion. Mr. Haworth went on to give details of the partnership business, and said debtor's father found £1,000 for this concern, whilst the lady, who afterwards obtained judgment, put between £700 and £800 into the concern. In the books these sums were entered as loans, and not as share capital. When starting on his own account, debtor was doing very nicely, and it was a great surprise to him to learn that he was liable for the amount advanced by the lady named in the case. It was not until this claim was made that debtor found he was insolvent. Evidently the lady had thought that if sufficient pressure was brought to bear, Mr. Garsden's father would come forward and pay the money. As a matter of fact, Mr. Garsden, sen., did offer £300, but this was not accepted, and debtor decided to file his petition. His Honour had also to consider the effect of a forced realisation of debtor's business. He assured the Judge that immediately debtor discovered his position he filed his petition. In the new Bankruptcy Act there was an enabling section which provided that if the only offence against a debtor was the one of not paying a sum equal to 10s. in the £, then it was within the discretion of the judge to grant a discharge, suspending it for the short period of one day. He asked for that step to be taken in order that it might go forward to the world that bankrupt had been put into the Court through reasons over which he had no control.

The Judge said, under these particular circumstances, he would like to know whether the Official Receiver would be willing to withdraw that portion of the report regarding debtor trading whilst insolvent. Debtor seemed to have had great misfortunes, and no one suggested that he had been guilty of dishonesty or of negligence. He relied upon the report of the Official Receiver in such cases, and he would like to have his view on this suggestion.

Mr. Plant said under the circumstances he would withdraw this part of the report.

His Honour said in that case there was only one complaint against the debtor—that his assets did not amount to a sum equal to 10s. in the £. He had come to the conclusion that debtor had been the victim of misfortune. There was no suggestion that he had been either careless or dishonest, and, therefore, he granted him his discharge, and suspended it for one month.

H. H. OXLEY (otherwise known as Oliver Huxley), consulting engineer, Hanwell.—Application for discharge. Bankrupt's assets are not equal to 10s. in the £ on the amount of the unsecured liabilities. His discharge was granted subject to his consenting to judgment being entered against him in the Brentford County Court by the Official Receiver for £310 1s. 3d. and £1 10s. costs of judgment.

Liquidations and Dissolutions.—DIESEL ENGINE CO, LTD.—This company is winding up voluntarily, with Sir W. B. Peat, of 11, Ironmonger Lane, E.C., as liquidator. A meeting of creditors is called for July 15th.

NO CELL, LTD.—This company is winding up voluntarily, with Mr. A. H. Partridge, of 2, Gresham Buildings, Basinghall Street, E.C., as liquidator. A meeting of creditors is called for July 16th.

THE PUMP AND POWER CO., LTD.—This company is winding up voluntarily, with Mr. L. R. Sankey, of 5, Coleman Street, E.C., as liquidator. A meeting of creditors is called for July 14th.

ISAAC STOREY & SONS, LTD.—A meeting will be held at 42, Spring Gardens, Manchester, on August 5th, to hear an account of the winding up from the liquidator, Mr. A. H. Pownall.

CAMBRIDGE ELECTRIC TRAMWAYS SYNDICATE, LTD.—A meeting will be held at 66, Victoria Street, S.W., on August 8th, to hear an account of the winding up from the liquidator, Mr. A. W. Langley.

CONSOLIDATED DIESEL ENGINE MANUFACTURERS, LTD.—On the petition of W. Lawrence & Son, creditors, Mr. Justice Astbury made an order for the compulsory winding up of this company. Counsel for the directors said they welcomed an investigation by an officer of the Court.

KENT ELECTRIC POWER SYNDICATE, LTD. — Particulars of claims must be sent by July 11th to the liquidator, Mr. F. A. H. Walker, of 2A, Railway Street, Chatham.

H. C. BARLOW & CO., electrical engineers, 52, Chapel Street, Salford.—Messrs. H. C. Barlow and H. A. Jackson have dissolved partnership. Mr. H. C. Barlow will attend to debts and carry on the business under the same style.

Book Notices.—"*Journal* of the Institution of Electrical Engineers." Vol. LII, No. 236. June 15th. With Index to Vol. LII. London: E. & F. N. Spon, Ltd. Price 3s. 6d.—This issue completes Vol. LII, and there will be no further issue of the *Journal* until next Session. The annual List of Members (revised to September 30th) will be posted in October. The contents of the present issue include the following papers:—"Predetermination of the Current and Voltage at the Receiving End of a Telephone or other A.C. Line," by Prof. J. A. Fleming; "The Bonecourt Boiler," by C. D. McCourt; "The Construction of a Wireless Station," by C. G. Roach; "Tests on Single-phase A.C. Commutator Motors," by E. A. Richards and D. Dunham; "Electrical Equipment of Collieries," by J. L. Thompson; "The Possibilities of Electric Traction on Railways," by J. L. Moffet; "The Laws of Dielectrics," by W. S. Flight; "Automatic Pressure Regulators," by E. L. M. Emtage and A. Arnold; and "Cascade Connections," by H. V. Henniker.

"Electrical Practice in Collieries." By D. Burns. Fourth edition. London: Charles Griffin & Co., Ltd. Price 7s. 6d. net.

"High-Power Gas Engines." By H. Dubbel and F. Weinreb. London: Constable & Co., Ltd. Price 18s. net.

"Reports for the year 1913 on the Science Museum, the Geological Survey and the Museum of Practical Geology." London: Wyman & Sons, Ltd. Price 5½d.

"Annales des Postes, Télégraphes et Téléphones." June. Paris: A. Dumas. Price 10 fr.

"Manual of Electrical Undertakings and Directory of Officials." By E. Garcke. Vol. 18, 1914-15. London: The Electrical Press, Ltd. 21s. net.—The new edition of this very bulky and comprehensive electrical *Manual* is now published, and as our copy lies before us awaiting review, we tremulously hesitate, wondering whether we could better sing its praises by breaking out into verse or by writing calmly about its bulky proportions, the completeness and variety of its contents concerning the electrical industry and its *personnel*, and so forth. Our rhymster being out of town, we adopt the latter course and proceed at once to say quite prosaically that the progress of the year dealt with statistically and in article form is a regular feature, and Home and Colonial electrical undertakings of all kinds, lighting and power, tramway and railway, telegraph and telephone, manufacturing and miscellaneous are detailed in the various sections. On the personal side there are given names and addresses of 12,000 chief officials, &c., of electrical undertakings, and members of institutions, also of members of electric lighting and tramway committees, and electrical contracting firms. Numerous maps of electrical systems are inset, and there is a host of other contents, making the book essential to everybody who requires conveniently at hand financial, general and personal information concerning the vast number of interests that go to make up what we call the electrical industry. We have nothing but praise for the book, unless it be a regret that it is apparently inevitable for some of the financial returns to be belated, and that it cannot somehow stop growing. The electrical industry is hardly likely to grow less as the years pass by, and we tremble to think what our *Garcke* will measure in thickness and weigh in pounds 10 years hence.

"Albalux" Shop Lighting.—MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., of Dalston, have sent us an illustration which graphically depicts the artistic effect that is obtainable by the use of Wotan drawn-wire lamps in semi-indirect fittings. The photograph illustrates one of the entrances of the large drapery and general establishment under the proprietorship of Messrs. Peppercorns, Ltd., Broadway, Deptford. The fitting used is of the Albalux design. Albalux fittings in most cases consist of opal glass reflecting and diffusing media, whilst white vitreous enamelled iron reflectors are used where necessary. We understand that the Albalux system is now being very extensively used for the lighting of large emporiums.

Trade Announcements.—MESSRS. DRAKE & GORHAM, LTD., have accepted the sole agency for Lancashire and Cheshire for commercial electrics for Edison Accumulators, Ltd., and have taken over the services of Mr. T. H. Rigg, of the Edison Co., as departmental manager.

MESSRS. H. R. WILLIAMS & CO., electrical engineers, of 100, High Street, Barnstaple, have disposed of the business to Mr. T. B. Jones, who has been with the firm for the past 15 years.

THE INTERNATIONAL TIME RECORDING CO., LTD., owing to greatly increased business, are giving up their premises in City Road, E.C., and have taken the entire five-storey building at 30-32, Farringdon Road, E.C., where their automatic recorders for time-keeping and job-costing can be seen.

Annual Outings.—The employés of the Western Electric Co., Ltd., travelled by special boat or special train to Clacton-on-Sea on Saturday, June 27th, on the occasion of their annual outing. The large gathering of over 1,500 spent a most enjoyable day in splendid weather. A sports meeting was held on the Clacton Football Ground.

The staff of Messrs. J. H. Butcher & Co., transfer printers, Birmingham, went for their annual outing on Saturday, June 27th. The party, 60 strong, journeyed by train to Worcester, and thence by steamer to the ancient town of Tewkesbury, where they were joined by Mr. J. H. Butcher and party, who had motored down. Dinner was served at the Bell Hotel. The toast of "The Firm" was proposed by Mr. J. Dalton, the works manager, who referred to the rapid strides that the business had made since they took possession of the present works five years ago, progress which was due to the enterprise and energy of the principal. Mr. Butcher responded. A vote of thanks was accorded to the Committee.

Accrington Corporation tramwaymen and their wives had their annual picnic on Thursday last week. They went to Liverpool, then crossed the Mersey to Birkenhead, and proceeded by motor to Chester.

The staff and employés of Messrs. Gent & Co., Ltd, Leicester, held their annual works outing on Saturday, June 27th. Accompanied by Mr. I. Hardy Parsons, a director, and Mr. H. Waddington, the works manager, the party spent an enjoyable day at Cleethorpes. After dinner, served on the Auckland Colonnade, members of the Committee expressed the thanks of all to the firm for their continued generous support of the outing. In the regretted absence of Mr. A. W. Staveley, the thanks were acknowledged by Mr. Hardy Parsons.

The second annual picnic of the electrical department of the Calico Printers' Association was held on Saturday, June 20th. The party, numbering upwards of 70, journeyed by train to Llandudno. On arrival breakfast was served, and afterwards a trip was made by steamer up the Menai Straits. Dinner was partaken of on the return. The weather was ideal and the day was a thoroughly enjoyable one.

The employés of Messrs. Page & Miles, Ltd., electrical engineers, of Brighton, Worthing and Eastbourne, numbering nearly 80, held their twenty-fourth annual outing on Saturday last, at Windsor. They were accompanied by the directors, Councillor J. W. Penfold (chairman), Mr. H. J. Miles, Mr. J. T. Baker, managing director, and Mr. A. C. Ganson, secretary. The Star and Garter Hotel was made the headquarters, and here a few friends from the city joined the party. A visit was made to the Castle. Among the toasts was that of "The Firm," proposed by Mr. F. Patching, and the chairman, in responding, mentioned that the Eastbourne branch was fully established, and that the past year had been one of great success owing to the good relations existing between the directors and their employés. They had added Mr. J. T. Baker to the list of directors. He also expressed regret at the enforced absence of Mr. E. J. Page, one of the managing directors, through the serious illness of his eldest son. The toast of "The Visitors" was proposed by Mr. H. J. Miles in humorous vein. He spoke of the exceedingly good feeling which existed among the firm and the manufacturers with whom they dealt, some of whose representatives were with them that day, viz., Mr. Laringer, Mr. H. Bonthorpe, of the General Electric Co., Ltd.; Mr. Hudson, of Messrs. Henley; and Mr. Loscombe Wallis, of Messrs. Jas. Fraser & Sons. Mr. Bonthorpe responded on behalf of the visitors. Subsequently a move was made for the launch trip to Boulter's Lock, the expenses of which had been generously defrayed by one of the visitors. On the return a smoking concert was organised. The arrangements of the day were made by Mr. J. T. Baker, one of the directors.

Catalogues and Lists.—Messrs. J. M. Doughty & Sons, Ltd., 214/222, St. John Street, Clerkenwell, London.—76-page catalogue illustrating a great variety of electric light fittings—electroliers, coronas, dish pendants, hall and bracket lamps, French brackets, bedroom pendants, table standards, in many styles and finishes. Prices are stated.

Messrs. G. M'Cartney & Co., Burnside Works, Cumnock.—Small 16-page illustrated pocket price list of "Orb" switches, fuse-boxes, power fuseboards, &c.

Electrical Apparatus Co., Ltd., Vauxhall Works, South Lambeth Road, London, S.W.—Folder giving illustrations of and brief references to their various meters, motor starters, motor control panels, and switchgear, &c.

Messrs. Ehrich & Graetz, Berlin.—Illustrated priced circulars of half-watt lamp fittings and "Triumph" electric fans.

Messrs. Falk, Stadelmann & Co., Ltd., 83-87, Farringdon Road, London, E.C.—Catalogue No. 364 of 24 pages, giving full particulars, code-words and reduced prices of "Efesca" wire lamps for private and street lighting, traction service, also for candle fittings, battery lamps; also English "Electra" carbon-filament lamps.

Messrs. J. H. Holmes & Co., Newcastle-on-Tyne.—Pamphlet No. 26 contains illustrated particulars, dimensions and prices of oil break switches for A.C. control.

Messrs. Smart & Brown, Erith, Kent.—A batch of lists and large illustrated sheets, setting forth information relating to the firm's paraffin electric sets, motor pumping sets, oil motor cranes, motor boats, milling and wheel-cutting attachment for lathes and motor winches.

Messrs. E. Brook, Ltd., Colne Road, Huddersfield.—Eight-page pamphlet tabulating particulars and prices of single, two and three-phase motors and motor-generator sets held in stock at Huddersfield.

The General Electric Co, Ltd., 67, Queen Victoria Street, London, E.C.—36-page catalogue of electrical accessories for motor-cars. It is a revised list of such manufactures and briefly describes and tabulates very clearly the prices of a range of sparking plugs, including the "Geeko" and the "Lodge"; switches for ignition control, and for car lighting; measuring instruments; interior lighting fittings for roof, bracket and other lighting; motor-boat lanterns, head-lights, rear-lights, &c.; car-lighting dynamos and equipments; "Geeko" ignition accumulators; motor generators; charging dynamos; Victor battery fans; "Klaxon" and "Dean" hooters, Osram lamps, &c.

Messrs. Crompton & Co., Ltd., Chelmsford.—12-page list (No. A600) containing a fully-illustrated general description of their C.M.B. system of control applied to main winding engines, and a list of some of the collieries where it is employed.

Messrs. Pitter's Ventilating and Engineering Co., Ltd., 20, Bishopsgate, London, E.C.—Card giving prices of 12-in. desk fans fitted with Pitter multiblade.

Messrs. Alfred Herbert, Ltd., Coventry.—Three new publications of 18, 22 and 32 pages respectively, all excellently illustrated, and containing full descriptive information regarding the following:—Automatic screw machines with self-selecting feeds; No. 4 Universal cutter and tool-grinding machine; No. 9 combination turret lathe.

Messrs. Credenda Conduits Co., Ltd., Chester Street, Aston, Birmingham.—Sixteen-page pamphlet containing full illustrated particulars of their electric fires. The new patent bar unit used in these is shown, and a number of different designs appear. Prices, dimensions, weights, consumption, &c., are given.

Veritas Sports.—The sixth annual athletic meeting of the Veritas Athletic and Social Club (Falk, Stadelmann & Co., Ltd.), was held last Saturday, at the King's Oak track, High Beech. A goodly company was present, and the large number of events was followed with sustained interest. Running, potato, slow cycle, egg-and-spoon and skipping, wheelbarrow, hurdle and three-legged races, also tug-o'-war (warehouse *v.* office), and many other contests were included in the programme. Inter-business house events were arranged between the Veritas staff and Robert Dyas, Ltd., Kearley & Tonge, and Osmond & Matthews. After tea Mrs. L. Thurnauer presented the prizes.

Holidays.—Messrs. T. W. Broadbent, Ltd., of Victoria Electrical Works, Huddersfield, announce that their works will be closed from Friday, July 24th, to the morning of August 4th, for the annual works holiday. An office staff will be in attendance.

The Leigh holidays are taking place this week, and the Anchor Cable Works there are closed down until July 13th.

The climate and resources of Deal and its attractions as a holiday resort are very fully set forth, with numerous appropriate pictures, in a booklet issued by the Corporation. Copies may be obtained from the Town Clerk in return for a postcard.

"Freezor" Fans.—As illustrating the ability of the General Electric Co., Ltd., to give prompt delivery of "Freezor" fans, it is interesting to note that over 1,200 "Freezor" fans were supplied for use in this country from June 29th to July 4th. Large stocks of every kind of "Freezor" fans are held in the company's central stores. The company delivered by their own service, or dispatched by carrier on receipt of order, the whole of the 1,200 fans mentioned, with the exception of a few orders delayed owing to the heavy storms at Birmingham on Wednesday last week.

France.—Under the style of Société de l'Electro-Policeman, a company, with a capital of 700,000 fr., has been formed at Paris (5, Avenue Constant-Coquelin) for the manufacture, sale, and installation of the burglar, fire and thief alarms "Auto-Policeman," "Auto-Gardien," and "Electro-Policeman."

Australia.—The Australian Customs authorities have recently given a decision to the effect that "Lamps for Electric Radiator" when imported separately are to be classified under No. 177 (E) of the Tariff, the duty being 15 per cent. on foreign, and 10 per cent. *ad valorem* on British goods.

LIGHTING and POWER NOTES.

Ammanford. — Proposed E.L. Purchase. — The U.D.C. at its last meeting decided to enter into negotiations with Mr. W. Herbert, with a view to the purchase from him of the electrical supply works in the town.

Australia.—The Northcote (Vic.) Council has decided to obtain a loan of £6,000 for an E.L. installation.—*Tenders.*

Bacup.—Street Lighting.—The T.C. has decided to apply to the B. of T. for sanction to a scheme of street lighting by electricity.

Bexhill.—Street Lighting; Mains Extension.—The T.C. has reduced the charge to the Highways Committee for public lighting from £4 14s. 8d. to £4 5s. per lamp per annum, for the 429 electric lamps in use.

The L.G.B. has consented to the extension of the electricity mains to the Little Common district, and the work is in progress.

Batley.—The T.C. has approved a recommendation of the Electricity Committee that an additional boiler be provided at the electricity works, and has accepted the tender of the Stirling Boiler Co., Ltd. The Council has also approved the following scale of charges for current supplied for working lanterns in picture palaces:—For working through motor-generators, 2½d. per unit; for lighting, the usual charge of 4½d. per unit.

Brighton.—YEAR'S WORKING.—The income of the Corporation electricity department for the year ended March last amounted to £98,093, against £96,196 in the previous year, and the expenditure to £50,873, against £48,649. After paying interest, £18,291, and sinking fund, £26,586, there was a net balance of £2,342, against £1,406. The reserve fund now stands at £14,196. The average total cost per unit was 2·02d., against 2·07d., while the generating costs remained the same, at ·74d. per unit. The units sold totalled 10,713,110, against 10,405,711, and the average price received for energy was 2d. per unit.

Cheshunt.—PROPOSED E.L.—The Council has formed itself into a Committee to consider the scheme of the North Metropolitan E.P.S. Co. and the Waltham Abbey and Cheshunt Gas Co. for the E.L. of the district.

Chipstead.—PROV. ORDER.—The Reigate R.D.C. has been notified that Mr. Gilbert Allom intends applying to the B. of T. for a prov. order for E.L. in an area which will include the Parish of Chipstead.

Clones.—WORKHOUSE LIGHTING.—The B. of G., after receiving tenders for both electric and gas lighting, has decided in favour of the former.

Continental Notes.—GERMANY.—Kommunales Kraftwerk Oppeln is the name of a joint stock company which is being formed by a number of rural district councils in Silesia to construct an electric supply system.

On the 5th inst. a 1,500-volt transmission line from the Spandau overland electricity works broke on a farm near Potsdam, which is fed from it. Ten Russian and Polish farm labourers were persuaded by one of their number to join hands to be "electrified" by touching one of the fallen wires, with the result that all were injured, and five were killed outright.

RUSSIA.—A scheme is at present under consideration for the establishment of a plant to utilise the power of the falls of the River Dnieper, between Ekaterinoslav and Alexandrowsk, in the generation of electrical energy for lighting and power purposes.

SWITZERLAND.—According to a recent report, 80 per cent. of the railway carriages on the standard-gauge railways in Switzerland are now lighted by electricity, only 12·3 per cent. being lit by gas, and 7·45 per cent. by petroleum lamps.

Coxhoe (Co. Durham).—STREET LIGHTING.—The East Hetton Colliery Co., having intimated its willingness to light the streets and roads in the district by electricity, on the same terms as have been accepted by Trimdon P.C., the P.C. has decided to apply to the Trimdon Council for full information regarding its plant, with a view to pushing on the work and having the district lit up this year, if possible. It was suggested that the Colliery Co. might light East Hetton village and the Electric Power Co. Coxhoe and Quarrington Hill.

Crewe.—STREET LIGHTING.—The T.C. has confirmed a proposal to substitute new metal-filament lamps for the present arc lights in Victoria Street, High Street and Mill Street. The Council has also permitted the General Post Office to arrange for an alternative stand-by supply of electricity to the postal sorting office, Weston Lane, from the L. & N.W. Railway Co.'s generating station, such supply only to be used on the failure of the Corporation's supply.

Criccieth.—PUBLIC LIGHTING.—A special meeting of the Council is to be held to consider a recommendation by the Lighting Committee that the question of lighting the district by gas be entirely excluded, and that the Council confine itself to a scheme of electric lighting, and that the views of the ratepayers be sought at a public meeting.

The Council decided to notify the Lleyn R.D.C. of its intention to apply for statutory powers to supply electricity to Penllyn and Llanystumdwy parishes.

Croydon.—The T.C. on the report from the borough electrical engineer as to the considerable reduction in the number of consumers taking current on the maximum-demand system, recommends that notices be served upon the occupiers of premises other than shops, stating that the charge on the maximum-demand system will cease, and that the price charged from the September quarter will be at the present flat rate of 3½d. per unit.

Dartford.—LOAN AMENDMENT.—Owing to the provision of a 1,000-KW. turbo-alternator in place of a 500-KW. set, as originally decided upon, the U.D.C. has applied to the L.G.B. for the loan of £15,500 for additional plant, &c., to be amended to £16,500.

Durham.—COLLIERY ELECTRIFICATION.—The North Bitchburn Coal Co., of Darlington, has recently decided to install at the Randolph Colliery, Evenwood, Co. Durham, a mixed pressure turbo-generator, and to drive the underground and surface machinery at this pit by electricity, and also to convey the current by overhead cables to the Gordon House Colliery, and subsequently to the Hylton Sinkings.

Ely (Cambs.).—PROV. ORDER.—The Gas Co. has informed the U.D.C. that it intends applying for a prov. order for E.L. in the parishes of Ely St. Mary, Holy Trinity, the College, and the hamlets of Stuntney and Chettisham.

Fairlie (Ayrshire).—PROPOSED E.L.—A poll is to be taken on the question of an offer of the Earl of Glasgow to supply the land and provide the capital for an E.L. undertaking for the district, providing that one-third of the property owners promise to use the same.

Glasgow.—HOSPITAL LIGHTING.—At the Sick Children's Hospital at Yorkhill, now nearing completion, nearly 2,000 electric lamps are installed. Thirteen lifts, and the whole of the laundry, kitchen, and other machinery, are operated by electric motors, of which there are, in all, upwards of 40; the ventilation is also entirely by electrically-driven fans. An automatic intercommunication telephone system having 30 stations; electrically-operated clock and bell systems and electro-medical and surgical apparatus are also installed. The electrical supply from the Glasgow Corporation mains is by duplicate cables. Messrs. Telford, Grier & MacKay, Ltd., carried through the lighting and general electrical installation work; Messrs. Waygood, Ltd., the lifts; and Messrs. D. & J. Tullis, Ltd., the laundry machinery. The electric clock and telephone systems are by the Magneta Time Co. and the Sterling Telephone Co. respectively. Expert service on behalf of the Hospital Board has been rendered by Messrs. James E. Sayers & Caldwell, consulting engineers.

Golcar.—PROPOSED E.L.—The Huddersfield T.C. has informed the U.D.C. that owing largely to the fact that it would be very difficult to check the energy supplied, it is unable to provide a bulk supply of electricity to the U.D.C.

Hornsey.—L.G.B. INQUIRY.—The scheme approved by the B.C. for the erection and equipment of an electricity sub-station at Muswell Hill was the subject of a L.G.B. inquiry on July 2nd; the loan asked for was £13,744. The extension of the electricity undertaking has been necessitated by the growth of the Muswell Hill and Highgate Woods areas. The sub-station buildings will comprise a transformer room, showroom, offices, &c. There was no opposition to the application.

Ipswich.—ANNUAL REPORT.—In his report on the working of the Corporation electricity department for the past year, Mr. F. Ayton, chief engineer, states that the result might be considered satisfactory. In spite of the increased cost of coal, the comparatively uneconomical working of the new turbine plant during the earlier part of the year, and heavy building repairs, the result was a net profit of £1,351. The total income was £27,453, and the working expenses £17,143. Capital charges absorbed £3,854, and repayment of loans £5,103. Of the net profit, £904 was allocated to capital expenditure, and the balance to the reserve and renewals fund, which stands at £1,152. 3,399,972 units were generated, against 3,069,302 in the previous year. The revenue of the installation department amounted to £4,919, and the expenditure to £4,750.

Irlam.—PROV. ORDER.—The D.C. has been informed that the Lancashire E.P. Co. intends to apply to Parliament next year for a prov. order to supply electricity in this district.

Japan.—A considerable amount of electric power remains idle during the daytime, reports the chief of the Tokio Municipal Electric Board. Means of utilising it for motive power were lately discussed among the officials in the Japan Department of Communications, but the result of the discussion was not encouraging. It is considered that it is most necessary that all the electric companies which are able to supply power should reduce the charges when their business has reached a paying basis. Unless such steps are taken, the time when the available power can be used freely for industries must be said to be far distant.

Kendal.—YEAR'S WORKING.—The working of the electricity department during the year ended March 31st last has resulted in a deficiency of £593. The output of current sold for lighting amounted to 63,179 and for power 32,555 units, a total of 95,734 units, being an increase of 20,888 units.

Lathom and Burscough.—PROV. ORDER.—The Ormskirk Electric Supply Co., Ltd., has notified the Ormskirk U.D.C. of its intention to apply for provisional orders to supply electricity within the urban district.

Leeds.—HALF-WATT LAMPS.—The City Square has been lighted by means of 16 500-watt 100 volt-Mazda half-watt lamps, each in an ornamental lantern; these lanterns were formerly used for 16 750-watt arc lamps, which have been displaced. The half-watt lamps only consume two-thirds as much energy as the arc lamps, and, of course, they will cost considerably less than the latter for repairs and attention. We understand from the B.T.H. Co., who supplied the lamps, that the effect of the new lighting is very satisfactory.

Llantrisant.—The South Wales E.P. Distribution Co. has applied to the B. of T. for consent to run 11,000-volt overhead transmission lines in the area of the R.D.C.

London.—WESTMINSTER.—INCREASED CHARGES.—A few months ago the City Council decided to renew, for a further period of 12 months from June 24th, the existing contracts with the Charing Cross E.S. Co., the Metropolitan E.S. Co., and the St. James's and Pall Mall E.L. Co. for the supply of electricity to the Council's buildings. All three companies have now intimated that, owing to the increased cost of coal, oil and materials, they are compelled to increase the charge from 2½d. to 3d. per unit for lighting purposes. The Charing Cross Co. proposes to increase the charge for power purposes from 2d. per unit to 10s. per KW. of connected demand, plus 1d. per unit consumed, while the Metropolitan Co. will not supply for this purpose. The St. James's Co. is making no change, at 1d. per unit consumed and a fixed charge of 7s. 6d. per rated H.P. The City Council is recommended to accept the amended terms.

POPLAR.—NEW LOANS.—Application is to be made to the L.C.C. for sanction to the following loans in respect of the electricity undertaking:—Purchase of site of coal conveyor wharf, £1,000; extension to generating station, £2,701; mains extensions, £4,303; for new distributors and minor mains extensions, £2,500.

STEPNEY.—The Electricity Committee recommends the Council to obtain statutory protection for the Limehouse generating station in order to avoid actions or other proceedings for nuisance, and that the Council promote a Bill for the amendment of the Electric Lighting Orders Confirmation (No. 6) Act, 1892, to render Sec. 76 inapplicable to the Limehouse station.

WOOLWICH.—The L.C.C. has asked for details of the work proposed in connection with a further loan on account of £15,000. The borough electrical engineer reports that the existing terms, with possible future restrictions, are such as to practically nullify the benefit expected from closing down the Plumstead works; he also advises the Council to obtain the support of Sir John Snell in its proposals.

BERMONDSEY.—The income of the electricity department for the year ended March 31st last was £30,329; the net surplus was £315. The units sold were 5,286,844, an increase of 704,689, and the maximum load was 2,279 KW. The gross profit was equal to 6·75 per cent. on capital outlay. The estimates for 1915 are based on 5,550,000 units being sold.

CITY E.L. PURCHASE.—The Streets Committee is advising the City Corporation that it would be inexpedient to purchase the City E.L. undertakings, either this or next year.

Luton.—YEAR'S WORKING.—The total working expenses of the electricity undertaking during the year ended March 31st last amounted to £15,692, as against £13,485 the previous 12 months; the income amounted to £27,360, as compared with £23,039; the revenue account shows a gross profit of £11,668, or £2,114 more than last year, and equal to 11·42 per cent. of the capital expenditure. The expenditure on capital account during the year was £12,879, making the total capital expenditure at the end of the year £102,139. New loans amounting to £37,800 were sanctioned during the year, bringing the total amount sanctioned at March 31st, 1914, up to £124,414. The Electricity Committee has recommended the appropriation of the balance in defraying the cost of certain portions of the works now in progress.

Manchester.—L.G.B. INQUIRY.—An inquiry was held on Tuesday relative to the application of the T.C. for powers to borrow £10,000 for motors, £19,000 for consumers' distributing stations, and £29,000 for boiler plant. Mr. Hooper, the inspector, criticised the borrowing of money for motors, a practice which smaller towns were giving up, and pointed out that by not borrowing the city would save money; he knew of no undertaking which could afford to pay money for the relief of the rates. It was mentioned that the department had contributed nearly £180,000 to rate relief. There was no opposition.

Newcastle-under-Lyme.—COTTAGE LIGHTING.—The Electricity Committee is considering the question of supplying electricity to small houses on the hire-purchase system.

For the year ended March 31st last, the income from the electricity undertaking was £2,969, and the expenditure £1,496, the net profit being £204.

Newtown.—PROV. ORDER.—Mr. H. Edwards has notified his intention to apply for a prov. order to supply electricity in the area.

Oldham.—Messrs. James Collinge & Sons, of Commercial Mills, Glodwick, are contemplating the electrification of the driving power for a part of their manufacturing plant.

PROPOSED LOAN.—The T.C. has sanctioned an expenditure of £40,000 for new machinery and extensions at the electricity works, on the recommendation of the E.L. Committee, and as the result of the report by Mr. Blackmore, of Stalybridge. The report has not been disclosed to the Council, according to the *Oldham Standard*, and no details are available.

Portaferry.—E.L. SCHEME.—A public meeting is to be held at an early date to take the necessary steps to provide an E.L. scheme, and to enlist the support of the Rural District and County Councils in its favour.

Redditch.—L.G.B. INQUIRY.—An inquiry was held last week, by Mr. T. C. Ekin, into the application of the T.C. for sanction to a loan of £18,000, for electricity purposes, and the inquiry was adjourned for the works manager to give more particulars of the scheme.

Reigate.—YEAR'S WORKING.—The gross profit on the electric light undertaking for the year ended March 31st last amounted to £4,071. The net balance was £272, and this has been carried to the renewals fund, which now stands at £1,818.

Salford.—PUBLIC LIGHTING.—The Corporation Tramways Committee has granted the application of the Swinton and Pendlebury Council for the use of tramway standards for public lighting.

Sheffield.—YEAR'S WORKING.—There is a net surplus on the working of the electricity undertaking for the year ended March 25th last of £14,449. The total income for the 12 months amounts to £149,891, as against an expenditure of £69,172. The expenditure on capital account to March 25th amounted to £2,353,305. Out of the above surplus it is recommended that £10,000 should be transferred to the renewals fund (making the total transferred to date £45,000), and that a further sum of £500 should be transferred to the fund for the purchase of motors for hire. The number of units sold during the period under review amounted to 26,546,718. The percentage of working expenses in proportion to total revenue worked out at 38·68.

Shipley.—YEAR'S WORKING.—The annual accounts in connection with the electricity department were submitted to a meeting of the Council last week. The profit on the year's working was £1,229; the reserve fund, including £990 brought forward from the previous year and £500 from other sources, totalled £2,700, and after allowing the costs of extensions and alterations at Dock Mill out of this fund, a balance was left to carry forward of £1,123.

Swansea.—The Assessment Committee has reduced the rateable value of the electricity undertaking from £3,900 to £3,650 net, which is equivalent to a saving in rates of £108 per annum.

Torpoint.—E.L. SCHEME.—The E.L. question has been definitely settled by the U.D.C. on July 2nd sealing the agreement with the E.L. Co.

Tunbridge Wells.—PROV. ORDER AND LOAN SANCTION.—The T.C. has decided to apply for a prov. order for the supply of electricity in the districts of Speldhurst, Bidborough, Langton, Pembury, Frant, &c., thus increasing the area of supply from 6·25 square miles to 28·5.

Sanction has been received from the L.G.B., without an inquiry, for a loan of £3,500 for machinery.

It has been decided during the Cricket Week to illuminate the town throughout by electricity, requiring 6,000 lamps in the roads, 1,000 in the Grove Recreation Ground and 1,000 on the Pantiles. Prizes are being offered for the most effective displays.

Walmer.—PROPOSED E.L.—The U.D.C. has appointed a Committee to co-operate with the Deal T.C. in the matter of electric lighting. It is understood that the Deal Council is disposed to entertain the question of applying for powers to supply electricity, and that it will be advantageous for the two local authorities to act together.

Warrington.—PROV. ORDER.—The Corporation is to make application to the B. of T. for a prov. order to supply current to Penketh and Great Sankey.

West Bromwich.—NEW PLANT, &C.—The Electricity Committee has entered into an arrangement to supply energy to the Steel Castings (Giles Foundry), Ltd., and additional generating plant and mains, estimated to cost £2,080, will be required. The Committee recommends that the installation of a battery be deferred for the present, and that the boiler house be extended, and a new boiler installed, at an estimated cost of £4,423.

Worcester.—At the June meeting of the City Council, Ald. Parker suggested that he could find a customer who would be glad to take over the electricity undertaking at a price of £150,000. For the next meeting of the Council, Mr. Maund has given notice that he will move that Ald. Parker's offer be accepted, and that the Electricity Committee be authorised to give effect to the resolution.

Application is to be made to the B. of T. for permission to supply energy in Claines, which is outside the city.

Wrexham.—PROPOSED LOANS.—The T.C. has directed application to be made to the L.G.B. for sanction to borrow £3,025 for extensions at the electricity works, and has accepted tenders amounting to £2,056 for new machinery.

TRAMWAY and RAILWAY NOTES.

Accrington.—It has been decided by the Accrington Corporation to make formal objection to the proposal now before the Light Railway Commissioners for the extension of the Accrington tramways at Clayton-le-Moors.

Baildon.—In connection with the prospective continuation to Baildon, of the Bradford Corporation's tramways, the Shipley Council last week decided to supply electricity for this purpose to the Baildon Council on the same terms as are granted to the Bradford Corporation.

Blackpool.—NEW CARS, &c.—The Corporation has decided to seek power to borrow £6,000 for additions to the Blundell Street depôt, for the supply of six open-type cars and electrical equipment, and for top-deck cars.

Bradford.—STORM DAMAGE.—A terrific thunderstorm and flood caused many thousands of pounds' worth of damage at Bradford on Wednesday, last week. The sewers and the Bradford Beck, a natural stream running under the city, burst, and the streets in the centre of the city were broken open and were quickly many inches deep in running water. For a time traffic, including the tramways, was stopped. Valley Road, in which are situated the electricity works, was flooded and a foot or more of water occupied the lower parts of the works. Fortunately, however, the plant was not affected. At Shipley the overhead equipment of the tramways was affected, and traffic had to be stopped; as a general result the tramway system was thrown completely out of organisation for the remainder of the day. Telephonic communication in the city was stopped during part of the afternoon. At the height of the storm lightning struck and fired a drapery establishment and the place was quickly gutted.

Burnley.—PROPOSED EXTENSIONS AND 'BUS SERVICE.—The T.C. has decided to secure powers to construct a tramway from the boundary to the Rawtenstall Corporation tramways, at Loveclough. It has also decided to run motor-'buses generally throughout the borough.

Colne.—The T.C. has decided to re-lay the permanent way in Burnley Road, from Primet Bridge to Philip Lane, at an estimated cost of £2,000, and to convert one car truck to the Peckham pendulum type at a cost of £25.

Continental Notes. — GERMANY. — ELECTRIC F.B. VEHICLES.—Out of a required total of 145 motor-vehicles, the Berlin Fire Brigade has already 74, of which 48 are electrically driven. The latter have covered 100,000 km. without a single failure, and the average cost over a period of six years has been found to be about £70 per annum, or about one-quarter that of a horse vehicle; this is in spite of a charge of 1·8d. per unit for energy, and the contracting out of repairs to private firms, in both of which items rearrangements now in progress are expected to produce substantial savings.

A concession has just been granted for the construction of an electric light railway of standard gauge among the foot-hills of the Riesengebirge between Hermsdorf, Schmiedeberg, and Brückenberg.

SPAIN.—A scheme for the construction of four lines of underground electric railways in the City of Madrid has been submitted to the Spanish Ministry of Public Works.

Doncaster.—The T.C., in Committee last week, decided that no present action be taken with regard to laying the line in Silver Street, or doubling the lines in the Market Place and St. Sepulchre Gate, and that all previous resolutions inconsistent with this recommendation when confirmed, shall be deemed to be rescinded.

The Tramways Committee has decided to ask the County Council what sum it would contribute towards the cost of relaying and paving the track to the original terminus at Bentley.

Dover.—LIGHT RAILWAY PROPOSALS.—The T.C. has decided to oppose the application of the Light Railway Co. for a five years' extension of time for the completion of the Dover, St. Margaret's and Martin Mill Light Railway, unless an undertaking is given that the system will not be used for the conveyance of coal, nor for any purpose other than the conveyance of passengers and small parcels.

Edinburgh.—PROPOSED PURCHASE.—The Tramway Committee has received a memorandum of the terms proposed by the Colinton Tramway Co. as to the proposed transfer of its undertaking to the T.C. The proposed terms include the taking over of the obligations of the company to the War Office, landowners, &c. An alternative suggestion was that there should be a joint working agreement. The Committee recommended that the terms be declined.

Proposed extensions of the Leith tramway system have been before a meeting of representatives from the Leith and Edinburgh Tramway Committees. It was suggested that Edinburgh should permit the construction of a tramway along the Seafield Road to King's Road, Portobello. An alternative scheme was a route from Blackhall *viâ* Seafield Road to King's Road, Portobello, a total mileage of about 6¼, about one-third of which is in Leith. No decision was arrived at by the conference.

Halifax.—YEAR'S WORKING.—The Corporation tramways accounts for the year ended March 31st, show passenger receipts £106,385; advertising on cars, £957; and parcel receipts, £2,147. The net profit for the year was £13,643, against £12,681 in the previous year.

Ipswich.—ANNUAL REPORT.—The report of Mr. F. Ayton, manager of the Corporation tramways department, on the past year's working of the tramways, shows that the revenue amounted to £23,825, an increase of £421 on the previous year; and the expenditure to £25,654, including working expenses, £19,888; capital charges, £3,623; and debt redemption, £2,142, a total increase of £2,472. There was, therefore, a net deficit of £1,828, against a profit of £268 in the previous year. This was partly met by £1,322, surplus from last year, and the remaining £506 was debited to the present year's working. Special attention is drawn to the slowness of the cars, which, owing to the narrow and congested streets, only average 5·51 miles per hour.

Leicester.—The T.C. has sanctioned the expenditure of £4,770 for the provision of canopy tops to 87 cars, which, it is estimated, will earn £7,000 more per year.

London.—S.W. RAILWAY ELECTRIFICATION. — On Saturday morning last a trial trip was made between Wimbledon and East Putney with one of the new electric trains to be used by the L. and S.W. Railway. The new coaches will carry each about 200 passengers, and are to be used on the Kingston Loop from Waterloo, *via* Wimbledon to Richmond and back to Waterloo.

The House of Lords Committee has rejected the L.C.C. proposal to construct a double line of tramways from the present Aldgate terminus along Mansell Street, with a single loop line round Trinity Square; the Bill containing the above proposal has passed a Commons Committee.

Yesterday morning a trial run was to be made in London with the new Edison battery 'bus for the South Shields Corporation.

Northampton.—The Tramways Committee of the T.C. has had under consideration, and recommends, the doubling of further portions of the Kingsthorpe section of the tramway track, thus completing the double line from Regent's Square to Kingsthorpe.

Rochdale.—STREET SWEEPER.—The Tramways Committee has decided to charge the Cleaning Committee 10d. per car-mile for working the tram-hauled street sweeper.

Sheffield.—ROAD TAX FOR 'BUSES.—The Corporation Bill, which has been before a House of Commons Committee, has been sanctioned the running of 'buses on four routes; the Corporation is to contribute ¾d. per car-mile 'to the road authorities in respect of wear and tear, but this is subject to revision by agreement or arbitration, and may be dropped in the event of a new Imperial grant. New road construction is not to be taken into account in calculating maintenance, and the 'buses are not to be charged with road widening.

Tunis.—La Compagnie des Tramways de Tunis has just placed a contract with the Thomson-Houston Co., of Paris, for two new steam turbines and alternators, each of 2,000-KW. capacity, for the power station at La Goulette.

United States.—The contract for the construction of the subway in Lexington Avenue, New York, has been awarded by the New York Public Service Commission, to the Rapid Transit Subway Construction Co., at $1,915,164. Bids for the construction of Section 1 of the Eastern Parkway Subway, Brooklyn, were opened. There will be four tracks for operation by the Interborough Rapid Transit Co. and the Brooklyn Rapid Transit Co. The lowest tender is that of the Crandford Co. at $2,195,000.—*Railway Review.*

Wigan. — MANAGEMENT CHANGES.— The T.C. has adopted a motion that the time has arrived for the electrical engineer to devote the whole of his time to the electricity department, and that he be relieved of the responsibility of the managership of the tramways. Another motion was passed that the appointment be considered of a general manager for the tramway apart from the permanent way.

YEAR'S WORKING.—The receipts of the Corporation tramways department for the past year amounted to £77,973, against £71,268 in the previous year, and the surplus was £4,690, against £1,178.

TELEGRAPH and TELEPHONE NOTES.

Wireless Telephony.—At a meeting of the Dominions Royal Commission last week, Mr. Godfrey Isaacs, managing director of the Marconi Wireless Telegraph Co., gave evidence. He said that the company was constructing stations at Carnarvon and New York that would be far superior to any in existence, and could send 100 words a minute by wireless. He anticipated that the service would be able to undertake the whole of the work of the Pacific cable. The company also contemplated the establishment of services between this country and the Argentine and Brazil, between France and New York, and between Norway and New York. He thought that atmospheric troubles would shortly be entirely overcome, and that the future of long-distance telegraphy, at greatly reduced rates, lay with wireless telegraphy. Mr. Marconi would probably be able to telephone to New York before the end of this year. Proposals were under consideration for the establishment of a Press service, to supply Canadian news to this country and *vice versâ* at ½d. per word. He anticipated a large reduction in telegraphic rates all over the world in the near future, especially in the British Empire, due to the development of wireless telegraphy.

China.—A wireless station has been erected in the French Concession at Shanghai. It will work in conjunction with the observatory at Siccawei, and is expected to have a range of 1,800 miles.

Germany.—The German Emperor recently visited the trans-Atlantic wireless station at Eilvese, under the auspices of the Hochfrequenzmaschinen-A.G. für drahtlose Telegraphie, and exchanged messages of greeting, *via* Tuckerton, N.Y., with the President of the United States and other dignitaries.

Orders by Wireless.—Wireless telegraphy, says the *Standard*, is used for transmitting orders by the commercial travellers of a well-known firm of tobacco merchants. A van accompanies them on their round, and inside it is a "wireless" operator, who sends out all urgent messages. Goods have been in certain cases delivered within one hour of the order being received, while messages have been sent from as great a distance as 20 miles from the central office.

The Telephone Service.—On Friday last the discussion on the Post Office Estimates was resumed in the House of Commons. The administration of the telephone system was attacked, but the Postmaster-General stated that in London last year 16,000 new subscribers were connected, and up to date this year 14,500 more, and denied that the service was so bad as it was made out to be. Inquiries addressed to 135,000 telephone users in London, of whom 128,000 replied, showed that 87 per cent. were "perfectly satisfied," 4½ per cent. "totally dissatisfied," and the remainder neutral. The proposed new rates were all based upon the measured-rate system, and he held out no prospect of any considerable reduction in the total payments by telephone users. The results obtained from the experimental check-meters had been satisfactory. He proposed to institute a Committee of Inquiry into the telegraph system, consisting of Sir A. Williamson (chairman), Sir W. Plender, Sir C. Stewart-Wilson, and a member of the staff.

Wireless on Board Ship.—In reply to questions in the House of Commons, Mr. Burns recently stated that an agreement was in preparation between the Board of Trade and the Marconi Co., to enable shipowners to obtain wireless installations on reasonable terms. Shipowners, however, would be under no obligation to obtain their apparatus from the company.

CONTRACTS OPEN and CLOSED.

OPEN.

Aldershot.—August 4th. U.D.C. One natural-draught chimney-type cooling tower. See "Official Notices" to-day.

Argentina.—July 15th. E.L. installation (public and private lighting) for the Dean Funes (Cordoba) Municipality.—*Review of the River Plate.*

Ashton-under-Lyne.—Corporation. July 29th. Arc lamp globes, lamp carbons, D.C. motors and D.C. motor starters. See "Official Notices" to-day.

Australia.—SYDNEY.—August 31st. Sydney Harbour Trust. Four electrically-operated semi-portable travelling cranes. Forms of tender from Mr. H. F. Norrie, Secretary to the Trust, Sydney.

PERTH.—August 19th. Electric lamps and fittings, for P.M.G. See "Official Notices" to-day.

August 19th. Telephone switchboards, galvanised iron and steel stranded wire, for Postmaster-General. See "Official Notices" to-day.

September 2nd. Telephone instruments and parts, glassware, battery material, chemicals for batteries, wire—cotton, silk or wool covered—telegraph and telephone insulators, for Postmaster-General. See "Official Notices" to-day.

MELBOURNE.—October 7th. Victorian Railway Commissioners. Four motor-driven air compressors and electrical equipment (motors, &c.) for the new workshops at Ballarat and Bendigo. Specification may be seen at the Board of Trade Commercial Intelligence Department in London.

Belgium.—NALINNES.—July 18th. Concession for supply of light and power for all uses. Particulars at the Maison Communale, à Nalinnes, Hainaut, Belgium.

BRUSSELS.—Shortly. Supply and installation of 11 dismountable telephone cabins, after the system of Grüsenmayer, for the Brussels central telegraph office. Cahier des charges spécial, No. 267. Particulars, Salle de la Madeleine, Brussels.

Blackrock.—July 13th. U.D.C. Underground mains, overhead mains, feeder pillars and public lighting. See "Official Notices" June 26th.

Bolton.—July 19th. Corporation. Converting plant, sub-station E.H.T. and H.T. switchgear. See "Official Notices" June 12th

Dartford (Kent).—July 20th. Telephones, extension bells, &c., at Joyce Green Hospital, for Metropolitan Asylums Board. See "Official Notices" to-day.

Edinburgh.—July 20th. Corporation Electricity Supply Department. Extension steam and exhaust pipe work at McDonald Road Station. Town Clerk, City Chambers.

France.—August 18th. French State Railway authorities (Bureaux du Service Electrique) in Paris (43, Rue de Rome). 17 electrically-operated travelling cranes for the new railway works at Sotteville, near Rouen.

PARIS.—July 17th. The French State Railway Administration intends to acquire 100 continuous-current electric motors for the suburban railway network. Particulars, Bureaux du Service Electrique, 3e Division, 72, Rue de Rome, Paris.

Gillingham (Kent).—July 17th. B.C. 12 months' supply of coal for the Electricity Department. Specification from the Borough Electrical Engineer, Gillingham Road.

Greenock.—July 23rd. School Board. Electrical installation at the Greenock Academy. Specification from Mr. A. F. Neven, Clerk, Municipal Buildings, Wallace Square.

Grimsby.—July 23rd. Corporation. 790 ampere-hour battery, reversible booster and switchgear. See "Official Notices" to-day.

Lancaster.—July 13th. Coal and slack for 6, 9 and 12 months respectively for the Corporation Electricity Works. Mr. G. C. Milnes, Marton St. Works.

London.—L.C.C. July 13th. One, two or three electrically-driven chassis, for Fire Brigade. See "Official Notices" June 19th.

July 14th. Five rotary converters of 1,500 KW. each, 15 main static transformers, two starting static transformers, and re-erection, &c., of existing motor-generators. See "Official Notices" June 19th.

July 30th. 10,000 or 5,000 driving and pony wheel tramcar tires, 300 axle forgings for tramcars. Chief Officer, Tramways Department, 62, Finsbury Pavement, E.C.

The Highways Committee recommends that tenders be invited for the supply of 125,000 metal-filament traction lamps, 22 British C.P., 115 volts, for use on the Council's cars.

Manchester.—July 21st. Corporation. Two steam boilers, for the Tramways Department. Specifications from Mr. J. McElroy, General Manager, 55, Piccadilly.

July 24th. Corporation sub-station. 6,600-volt switchgear (one year's requirements); fuse boxes (two years' requirements). See "Official Notices" to-day.

Montenegro.—July 13th. Montenegrin Department of Posts and Telegraphs. Various telegraph stores and instruments. Some particulars may be seen at the Commercial Intelligence Branch of the Board of Trade, London, E.C.

Pittington (Durham).—July 11th. Poles, lamps, cables, &c, for the Parish Council. Specification from Mr. T. Carson, Clerk.

Ramsbottom.—July 16th. One electrically-driven sludge pump, with motor, wiring, countershafts, gearing, &c., complete. Specifications, &c. (£2 returnable), Messrs. Jas. Diggle and Son, Civil Engineers, Hind Hill Street, Heywood, Lancs.

Salford.—July 13th. Coal for the Electricity Department. Borough Electrical Engineer, Electricity Works, Frederick Road, Pendleton.

July 13th. Steel and concrete foundations for 5,000-KW. turbo-alternator. Borough Electrical Engineer.

South Africa.—BEAUFORT WEST (CAPE PROVINCE). August 19th. Proposed electric lighting scheme. Contract No. 1 comprises two 70-B.H.P. suction gas engines, two 48-KW. dynamos with static balancers, one motor booster, one switchboard and one battery of 250 cells. Contract No. 2 comprises overhead equipment, underground mains, and material for house connections. Specifications from Mr. C. G. Trevett, 70, Fletcher's Chambers, Cape Town. Tenders to Town Clerk.

Southampton.—July 13th. Corporation. Supply and erection of coal conveyers at the electricity works. Specification from the Borough Electrical Engineer.

Spain.—July 15th. Municipal authorities of Agreda (province of Soria). Concession for the electric lighting of the town during a period of 15 years.

July 20th. The municipal authories of Chillon (province of Ciudad Real) are inviting tenders for the concession for the electric lighting of the town during a period of 30 years.

Stockton-on-Tees.—July 24th. Corporation. Coal for use on mechanical stokers, for the Electricity Department. Forms of tender from Mr. J. J. Smith, Borough Electrical Engineer.

Turton.—July 22rd. U.D.C. Overhead lines and underground cables. See "Official Notices" to-day.

Walsall.—July 14th. Corporation. Four water-tube boilers, superheaters, economisers, pumps, pipes, &c. See "Official Notices" June 19th.

July 14th. Corporation. Two 3,000-KW. turbo-alternators with surface condensers, and motor-generator. See "Official Notices" June 19th.

Warrington.—July 21st. Extra-high-tension switchboard feeder panel and low-tension switchboard feeder panel, for Borough Electricity Dept. See "Official Notices" to-day.

West Ham.—July 20th. Lighting installation at Rosetta Road School, for Education Committee. See "Official Notices" June 26th.

Whitstable.—July 17th. U.D.C. Electric motors, switches, &c., at the sewage pumping station. Specifications from Messrs. Strachan & Weekes, 9, Victoria Street, S.W.

Wrexham.—The T.C. has instructed the electrical engineer to obtain tenders for a motor required in connection with the new generating set.

York.—July 13th. Corporation. 500-KW. rotary converter, with transformers and switchgear. See "Official Notices" July 3rd.

CLOSED.

Accrington.—The T.C. has entered into a contract with the Chloride Electrical Storage Co., for the cleaning and maintenance of the battery at the works for 8½ years, at an annual charge of £166.

Australia.—Commonwealth Home Affairs Dept. :—
Telephone exchange at Lidcombe, £976.—John Bright & Son.
Post and telegraph office at Bondi Junction, £1,825.—Beat Bros.

Barrow.—For the T.C. :—
Re-tubing of No. 1 economiser.—Green & Son, £230.
Coal.—O. M. Huartson, 18s. 9d. per ton.

Batley.—The T.C. has accepted the tender of the Stirling Boiler Co., Ltd., for supply of a multitubular boiler, with pipework, for the electricity works.

Blackpool.—The Corporation has accepted the tender of Messrs. Mather & Platt, Ltd., for a new electrically-driven sewage pumping plant to be put down at Layton.

Brighton.—The T.C. has accepted the tender of Messrs. Geo. Lynn & Sons for alterations, &c, at North Road electricity works, at £1,834.

Burnley.—The E.L. Committee has accepted the tender of the B.I. & Helsby Cables, Ltd., for 2,160 yds. of ·1-in. cable, 1,080 yds. of ·05-in. cable, and 3,410 yds. of ·25-in. traction cable, for £1,008.

Calcutta.—Messrs. George Anderson & Co., Ltd., of Carnoustie, have received the order for the first batch of 11 electric travelling wharf cranes out of 58 required by the Port Commissioners in Calcutta, the present contract figure being approximately £10,000. The order was obtained in competition.

Canterbury.—The T.C. has appointed Mr. G. E. Dashwood to carry out electrical engineer's work for the next half-year.
The T.C. has also accepted the offer of Messrs. Pritchetts & Gold to renew their contract for battery maintenance for a term of 10 years at £80 per annum, and the tender of Mr. Chas. Mount, for extensions to the coal bunkers at the electricity works, at £52.

Clacton-on-Sea.—The U.D.C. has sealed a contract with Messrs. Johnson & Phillips, Ltd., for the supply of cable, &c.

Colne.—The following tenders have been accepted by the T.C. :—
United Car Co.—Car and truck, £516.
B.T.H. Co.—Electrical equipment and gears, £254.

Dartford.—The U.D.C. has accepted the tender of Messrs. E. J. & W. Goldsmith, Ltd., for 3,000 tons of Aberpergwym rubly culm coal, for the electricity works, at 13s. 1d. per ton.
The Council has also accepted the tender of Messrs. Fraser and Chalmers, Ltd., for a 1,000-KW. turbo-alternator, at £4,554, in lieu of the 500-KW. set provided for in the original scheme; and the tender of Mr. J. W. Ellingham for an annexe to the generating station, at £290.

Darwen.—Orders for two new electric tramcars were given by the Tramways Committee last week at over £900 per car. The bodies will be built by the United Electric Car Co., the electrical equipments supplied by Messrs. Dick, Kerr & Co., Ltd., and the trucks by the Brush Co.

Doncaster.—The Tramways Committee has accepted the following tenders for the extension of the tramways to Warmsworth and Woodlands :—
Contract No. 1.—Warmsworth. J. W. Pearce & Co., Ltd., permanent-way construction, £7,000.
Contract No. 2.—Brodsworth. Edwards & Co., permanent-way construction, £10,433.
Contract No. 3.—B I. & Helsby Cables, Ltd., copper bonds, £341.
Contract No. 4.—Guest, Keen & Nettlefolds, Ltd., tie-bars, bolts, nuts, &c., £396.
Contract No. 5.—Hadfield's, Ltd., points and crossings, £1,457.
Contract No. 6.—Mr. Wilson, casting tramway rails, £150.
The Education Committee has accepted a revised tender by Messrs. Dixon & Sons, of Leeds, for the installation of electric lighting at the new Doncaster Technical School, at £820.

Eccles.—The Public Lighting and Electricity Supply Committee has accepted the following tenders :—
Earl of Ellesmere.—Screened washed nuts, 13s. 6d. per ton; best selected house coal, 18s. 9d. per ton.
J. Aldred.—Screened ordinary quality house coal, 14s. 2d. per ton.
Salford Gas Department.—Best gas coke, 11s. 8d. per ton.

Edinburgh.—The contract for the electrical installation at Redford Barracks, Edinburgh, has been placed with Messrs. Lowdon Bros.

Felixstowe.—The U.D.C. has accepted the tender of Messrs. W. Simms & Co., at £554, for the erection of overhead lines, &c., in connection with the change over from two-wire to three-wire system.

Folkestone.—The T.C. has accepted the tender of the Electric Street Lighting Apparatus Co., for standards for public lamps, with harps and canopies for lamps, at £5 11s. each.

Grimsby.—The Public Lighting Committee has accepted the offer of Opel Motors, Ltd., to supply an electric chassis, including motor and a new battery of accumulators, &c., at a cost not exceeding £200.

London.—L.C.C.—The Highway Committee reports having received the undermentioned tenders for the supply of trailer cars, and the equipment of a number of electric cars with couplers and traction gear for drawing trailers on the Council's southern tramways :

	50 trailer cars and equipment of 200 cars as tractor cars.	100 trailer cars and equipment of 200 cars as tractor cars.	150 trailer cars and equipment of 200 cars as tractor cars.
Brush Elec. Eng. Co., Ltd.	£29,500	£51,900	£74,200
Hurst, Nelson & Co., Ltd.	31,300	56,200	80,750
United Electric Car Co., Ltd.	33,350	58,600	83,750
Norddeutsche Waggonfabrik A.-G.	35,500	65,000	93,500

The Committee recommends the acceptance of the tender of the Brush Elec. Eng. Co., Ltd., for the supply of 150 trailer cars and the equipment of 200 cars as tractor cars, for £74,200.
The Committee recommends the termination of the tender of Messrs. Howarth & Houson for 12 months' supply of tramway fittings, equipment, &c, accepted on March 25th, the firm having gone into bankruptcy.
The Great Northern Railway Co. has placed the contract for the supply of carbon filament lamps and station lighting reflectors for the ensuing 12 months with Messrs. Siemens Bros. Dynamo Works, Ltd.
FULHAM.—The B.C. Electricity Committee recommends the acceptance of the following tenders for coal for the electricity undertaking :—
Messrs. Gilman & Co., 5,000 tons of ⅝-in. Mapperley Smithams nutty slack, at 12s. 6d. per ton; Messrs. Usher & Co., 2,000 tons of ⅝-in. Bedworth peas, at 11s. 0½d. per ton (subject to a trial barge-load proving thoroughly satisfactory); Messrs. Cory Bros., 2,000 tons of Gedlings High Hazel ½-in., at 10s. 11d. per ton.
HAMMERSMITH.—The B.C. Electricity Committee reports the receipt of the following tenders for two cast-iron transformer pillars :—

Hardy & Padmore (recommended)	£46
B.I. & Helsby Cables, Ltd.	66

POPLAR.—The Borough Council has been recommended to accept the tenders of the New Conveyor Co., at £519, and Messrs. Fraser and Fraser, at £115, for the extension of the coal conveyor and for the provision of two ash-bins respectively at the electricity works.

Lowestoft.—The tender of the B.I. & Helsby Cables, Ltd., for half a mile of overhead trolley wire, at £39, has been accepted by the Tramways Committee.

Maidstone.—The T.C. has accepted the tender of Messrs. Wm. Cory & Son, Ltd., for coal for a year for the electricity works, at 13s. 7d. per ton for Northumberland rough smalls, and 16s. 3d. for Yorkshire house screenings.

Manchester.—The Electricity Committee has accepted the tenders of the Western Electric Co., Ltd., and Messrs. Chas. Macintosh & Co., Ltd., for supplies of cable. The tender of the British Westinghouse Co., for a 5,000/6,000-KW. turbo-alternator at the Stuart Street station has been accepted, and licence has been granted to sub-let to the following firms :—Alternator, Siemens Bros. Dynamo Works, Ltd.; portion of pipework and condensing plant, Messrs. Mirrlees, Watson & Co., Ltd.
The Tramways Committee has accepted the quotation of the Tudor Accumulator Co., Ltd., for the welding of rail joints, and also that of Messrs. W. Macfarlane & Co., for the ironwork for tramway refuges.

Peterborough.—The T.C. has accepted the tender of Messrs. J. Fairweather & Son for coal for the electricity works for a year, at 14s. per ton for Tibshelf peas (½ in. by 1 in.).

Shipley.—The following tenders have been accepted by the D.C. :—
British Westinghouse Co.—Three sets of switchgear for sub-stations, £79 the Council's workmen to do the fixing.
Herbert Morris, Ltd.—Ten-ton crane for the engine house.
Sturtevant Co.—Air pumps.

Sheffield.—The City Council is recommended to accept the following tenders for supplies :—

Willans & Robinson, Ltd.—Manufacture and storage of spare blading material, £947.
Dick, Kerr & Co., Ltd —3pare coils for alternator, £558.
Stirling Boiler Co., Ltd.—Tubes for two Stirling boilers, £208.
Davy Bros., Ltd.—Removal of the existing tube box and supp'ying a new air heater on Stirling boiler, £195.
Steel, Peech & Tozer, Ltd.—1,000 tons of tram rails.
David Ashton & Co.—New gene ating set at the Lumley Street destructor, £449.

Stretford.—Contracts have been placed by the Tramways and Electricity Committee, as follow :—

Lancashire Dynamo, &c., Co., booster	£473
Bertram Thomas, switchboard, &c.	314
Tudor Accumulator Co., battery	2,823

Sunderland.—The T.C. on Wednesday accepted the following tenders on behalf of the Electricity and Lighting Committee :—

W. G. Farrow & Co.—Cast-i on gutters, cast-iron b nds.
Jackson Electric Stove Co., Ltd.—Domestic cookers.
Carron Co , Ltd.—Domestic cookers.

Warrington.—The Electricity and Tramways Committee has accepted the following tenders :—

Titan Trackwork Co., Ltd.—Special trackwork, £247.
A. Thorne & Sons.—Two sockets for tramway poles, £22.
Thermit, Ltd.—About 100 Thermit welded joints, 2is. 6d. per joint.

West Bromwich.—The Electricity Committee has made arrangements with Boston & Son and the Aldridge Colliery Co., for the supply of 12,000 tons of slack during the ensuing year.

Wrexham.—The T.C. has accepted the following tenders :—

Lancashire Dynamo Co.—Dynamo, £616.
Belliss & Morcom, Ltd.—Engine, £1,055.
British Westinghouse Co., Ltd.—Condenser, £389.

FORTHCOMING EVENTS.

Salford Technical and Engineering Association.—Saturday, July 11th. Visit to Carborundum Co., Ltd., Trafford Park.

Junior Institution of Engineers.—Saturday, July 18th. At 2.30 p.m. At Purfleet. Visit Tunnel Portland Cement Works.

Nottingham Society of Engineers.—Saturday, July 18th. Ladies' day: Visit Sherwood Forest.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued :—

Headquarters will be opened daily for the transaction of regimental business from 10 a.m. till 4 p.m., except Saturdays, on which days the opening will be from 10 a.m. till 12 noon. Headquarters will be closed for all purposes on August 3rd and 4th, 1914.

(Signed) F. R. HOLT-WHITE, Capt. R.E., Adjutant,
For Officer commanding L.E.E.

NOTES.

Electrical Contractors' Association of Scotland.—Satisfactory reports of work done in branches in Glasgow, Edinburgh, Dundee and Aberdeen were submitted at the annual general meeting in Edinburgh, when Mr. Alex. Pratt, the President, was in the chair. The accounts of the treasurer showed the Association to be in a sound position financially. The following office-bearers were elected :—President, Mr. E. J. B. Lowdon, of Messrs. Lowdon Bros. & Co. ; vice-president, Mr. T. B. Wright, of Messrs. Anderson and Munro, Ltd. ; secretary and treasurer, Mr. J. M. Davies, jun., C.A. ; and solicitor, Mr. Walter Finlay, W.S.

Copper.—A comparison of the statistics for the fortnight ending June 15th with those for the whole month, as set forth in Messrs. H. R. Merton & Co.'s tables, shows that it is impossible to estimate satisfactorily the position for the month from the figures for the first half. While supplies from North America up to June 15th were 14,475 tons, the quantity for the whole month was 36,086 tons, considerably under double the first figure. Spain and Portugal, on the other hand, show a very low figure for the fortnight, 226 tons, and an unusually high one—3,029 tons—for the month. Chile shipments were 1,400 up to June 15th, and 3,500 for the month, slightly above the average. Australian were 1,900 tons, and 2,550 for the two dates, the latter rather a low figure, average for the past 12 months being 3,450 tons per month. The total supplies were not much less than double the fortnightly figure, 21,708—total, 50,636—but not sufficiently near for the first to be reckoned as representing half the second.

The visible supplies are steadily maintained. On June 15th English stocks were 13,436 tons ; on June 30th, 14,721. European visible supplies were 32,920 tons, and 33,271 on the same dates. The latter figure is 900 tons higher than that for the end of May. The consumption during the month—49,735 tons—was fairly high, so the increase in stocks cannot be entirely attributed to depression in the general outlook.

Stock in American producers' hands (as published by the American Producers' Association) was 31,401 tons at the end of April, and 37,653 tons at the end of May. The world's visible supply at the end of May was 70,023 tons, an increase of 9,344 tons over the quantity for the end of April.

"Give us Back our Skin."—A dispatch from Pittsburg says that this is the heading of an article being issued by the striking employés of the Westinghouse Co. at East Pittsburg and Swissvale. The article criticises Charles Mensor, an employé of the Union Switch and Signal Co., who returned to work against the will of his fellow employés, who some time ago gave a large amount of their cuticle that his life might be saved by the skin-grafting process. Mensor was injured in an accident in the plant 18 months ago. Skin-grafting was the only means of saving his life. Eight fellow-workmen contributed 102 sq. in. of skin for use in the operation, which was successful. According to the strikers, Mensor was the first to desert them. Threats and entreaties were of no avail, and the strikers' publication came out with the words "Give us back our skin" across the top of the sheet. It also said that if Mensor was caught on the streets the skin he "borrowed" would be taken from him. Mensor is escorted by a policeman to and from his daily work.

A Well-Deserved Sentence.—At Newcastle-on-Tyne Police Court on Wednesday, Felix Murphy, a labourer, was charged with stealing a pair of rubber gloves, the property of the Cramlington Coal Co., Ltd., from the power house at the Shankhouse Colliery. The solicitor for the Coal Co. stated that accused went into the power house, and after securing possession of the gloves put them on and commenced interfering with the electrical plant. The ventilating fan for the mine was stopped, and 25 to 30 men, who were underground at the time, ran a grave risk of being suffocated. As a result of the damage done by accused to the plant, the pit was laid idle for a day. In sentencing the prisoner to three months' imprisonment, with hard labour, the chairman said he should feel thankful that he was still alive.

Electricity Supply Rifle League.—In connection with the above League a prize meeting was held on the 27th ult. on the range of the Hackney Electric Rifle Club, Clapton, when there were 40 members competing for the various events at 25, 50 and 100 yards. The weather was on its best behaviour, but some of the competitors would have preferred a cooling breeze, as they found the sun too powerful, and the shooting was not up to standard. The following were the results :—

25 YARDS SCRATCH.—F. Winchcombe (98), first, attaché case ; W. Mursell (96), second, case of brushes ; E. Matthews (96), third, cigarette case.
25 YARDS HANDICAP.—H. T. Dartnall (98·71), first, barometer ; H. A. Pearman (98·5), second, case of fish carvers ; C. Saunders (98·36), third, tea set.
25 YARDS RAPID.—R. Tufnell (91), first, carriage clock ; W. C. Young (89), second, case of fish eaters.
50 YARDS SCRATCH.—J. Harrison (100), first, kit bag ; H. J. Cope (97), second, flower stand.
50 YARDS HANDICAP.—E. Matthews (98·28), first, tantalus ; P. Barrow (97·69), second, case of tea knives ; A. T. Atkins (97·56), third, Toby beaker.
100 YARDS SCRATCH.—F. Winchcombe (93), first, flower stand ; F. Foster (92), second, jam dish.
CHAMPIONSHIP.—F. Winchcombe (285), gold medal.

The President of the League (Mr. L. L. Robinson) presented the prizes at the conclusion of the shooting, which lasted until after seven o'clock, and also handed over to the Westminster Club the handsome shield which has been purchased for presentation to the champion team each year. The usual votes of thanks were accorded before the company dispersed.

Complimentary Dinner to Sir John Snell.—A general desire having been expressed that the honour of knighthood recently conferred upon Sir John F. C. Snell, President-Elect of the Institution of Electrical Engineers, should be made the occasion of a complimentary dinner in the early autumn, a committee is in course of formation to make the necessary arrangements. Those wishing to associate themselves with the event are requested to send their names as soon as possible to any one of the following :—

P. F. Rowell, the Institution of Electrical Engineers, Victoria Embankment, W.C.
D. N. Dunlop, British Electrical and Allied Manufacturers' Association, King's House, Kingsway, W.C.
A. H. Dykes, Association of Consulting Engineers, 11, Victoria Street, S.W.
H. F. Proctor, Incorporated Municipal Electrical Association, The Exchange, Corn Street, Bristol.
L. G. Tate, Electrical Contractors' Association, 20, Bucklersbury, E.C.

Parliamentary.—SECOND AND THIRD READINGS.—In the House of Commons on June 29th the Yorkshire Electric Power Bill was read a second time ; and in the House of Lords on June 30th, the Bristol Corporation (Tramways) Bill, and the Glasgow Corporation (Tramways, &c.) Bill, were read a third time ; on Monday the Deal and Walmer Gas and Electricity Bill passed its third reading ; on Tuesday the Norwich Electric Tramways Bill passed through the same stage.

Platinum.—It is reported from Paris that large quantities of platinum have been discovered in the North Ural district, about 90 km. to the east of Cologne.

Foreign Trade in June.—The official figures published this week show that in the value of exports during June there was a fall of nearly three millions sterling or 6·9 per cent. as compared with the same month in 1913. For the six months, with a total of 255½ millions sterling, there is a decrease of practically £1,600,000 or 0·6 per cent. The export decreases during the month have occurred chiefly in cotton piece goods, iron and steel, and new ships. The electrical and machinery exports are down for the month, and the imports slightly up, as shown in the following figures; for the six months, machinery imports and exports are both up, but electrical exports show a large fall.

IMPORTS.	*Month of June*	*Inc. or dec.*	*Six months, 1914.*	*Inc. or dec.*
	£	£	£	£
Electrical goods and apparatus, excluding machinery and uninsulated wire ...	124,401	+ 8,140	804,645	+ 58,516
Machinery	689,059	+ 93,814	4,144,344	+386,606
EXPORTS.				
Electrical goods and apparatus, excluding machinery and uninsulated wire ...	271,280	− 30,174	1,704,229	− 978,582
Machinery	3,098,382	−135,528	19,469,555	+1,045,012

Metalliferous Mines.—The Royal Commission appointed to inquire into the subject of metalliferous mines and quarries, has issued its report this week, recommending that the application of the Factory Act to these should be replaced by the adoption of a special Act, providing for inspection, and special regulations in the case of mines where inflammable gas is found.

Fatality.—The Leeds City Coroner (Mr. J. C. Malcolm), on July 1st, held an inquest touching the death of Joseph Roddy (39), linesman in the employ of the General Post Office. The evidence showed that deceased left home on the previous Monday morning, apparently in the best of health, and was engaged in the task of fixing notices on Post Office telegraph and telephone poles which also carried at the top the wires of the Yorkshire Electric Power Co., warning the Post Office workmen against ascending the poles beyond a platform separating the Electric Power Co.'s wires from the Post Office wires, on account of the danger from the former. Towards the top of each pole was fixed an iron platform to prevent workmen getting too close to the wires. Deceased had to affix 56 notices, and when engaged in the task of putting one on a pole at Rothwell—which was the thirty-sixth of a series—a young woman, named Edith Gould, saw a flash and the deceased lying on the ground. Help was obtained, and he was taken to the Leeds Infirmary, where Dr. Flint found that he was unconscious, but suffering from severe shock; his hair was singed, and he had severe burns on his face, his hands and knees. On the left side particularly there were also other injuries to the body caused by the fall. Deceased died within an hour after admission to the Infirmary. The expert witnesses who were called could give no explanation for the accident. Mr. Arthur Edwin Bland, senior inspector in the employ of the Post Office, said Roddy was engaged on special and dangerous work at the time of the accident. Deceased had had 15 to 20 years' experience of the work, and was a most careful man. A verdict of "Accidental Death" was returned.

Gyroscopic Stabiliser for Aeroplanes.—Mr. E. A. Sperry, the inventor of the Sperry gyro-compass, which is largely used by the American Navy, has carried out tests in France with a stabilising device mounted on an aeroplane. According to the *Electrical World*, use is made of four gyroscopes with their axes at right angles. It is possible to tilt the machine sufficiently to make turns safely, but the aviator cannot tilt it to a dangerous angle. The gyroscopes operate valves leading to two servo-motors which control the planes and steering gear of the machine. The entire stabilising equipment weighs 100 lb. and is operated by alternating current from a generator driven by the aeroplane engine.

Electrical Material in Russia.—Speaking at the annual meeting of the Spies Petroleum Co. in London last week, the chairman, (Mr. J. Annan Bryce, M.P.), said it was mentioned in the report that the completion of the electric station had been delayed by non-delivery of material. "This applies especially to material ordered in Russia, and I may add, that another electric installation ordered by one of our neighbours has been delayed even more than ours. Some people have said, 'Why do you not see that your material is delivered?' Well, gentlemen, you can only order from the ordinary sources in Russia. If you order outside you have to pay 100 per cent. import duty, and it would be madness to work your business on the basis of paying 100 per cent. import duty. This difficulty we have had in obtaining the delivery of materials has applied to all the other industries in Russia. Every industry in Russia has been hampered by it, and so bad has it been that representations have been made to the Government to withdraw the import duty on iron in order that there might be a chance of obtaining delivery from outside. People were willing to pay a higher price demanded by Russian producers so long as they could get delivery, but not being able to get deliveries in consequence of the enormous pressure of business, they have been pressing the Government to withdraw the import duty temporarily, but they have refused to do so. This shows that the criticism on the company for not getting delivery of pipes is absolutely absurd and preposterous. The Government Commission of Inspection has been so satisfied with the work so far done that it has dispensed with further inspection. Our installation is now in partial operation, and the use of the power is being gradually extended over our fields. But the transference from one source of power to another over a large sphere of operations is necessarily a somewhat slow process, and the full benefit of the change may therefore not be reaped for some time. We are having numerous applications from other producers for the supply both of power and of light."

Educational Notes.—The Verband Deutscher Elektrotechniker is organising a special summer series of six lectures by specialists on high voltages, to be given at the Technical High School in Charlottenburg in September next. The example is worth notice.

Inquiry.—A correspondent asks for the name and address of the maker (Continental) of a carbon brush suitable for turbo-dynamos, bearing the mark N R C 2 X.

Appointments Vacant.—Switchboard attendant (37s. 6d.), for Northampton Corporation; jointer, for Borough of Haslingden; plumber-jointer for Salford electricity works; electrical drawing office and laboratory instructor (£125) for City and Guilds Technical College, Finsbury. Particulars are given in our advertisement pages to-day.

Institution of Civil Engineers.—On Thursday last the annual conversazione of the Institution was held in the new building, together with an exhibition of scientific and engineering apparatus.

Electric Charging for Commercial Vehicles.—The County of London Electric Supply Co. are now prepared to charge electric vehicle batteries at their City Road station, and facilities have been provided for the drawing in and standing of the vans in question. All inquiries as to rates are to be addressed to their head office, Moorgate Court, Moorgate Place, E.C.

Annual Holidays.—The British Westinghouse Co. announce that their works will be closed from Friday, July 24th, until 7 a.m. on Tuesday, August 4th, for the annual holidays. A staff will be in attendance to deal with matters of extreme urgency.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—On Friday, July 3rd, MR. HERBERT COOCH, assistant City sub-stations engineer of the Charing Cross, West End and City Electricity Supply Co., was presented with a mahogany timepiece on the occasion of his marriage. Mr. Brazil, the head of the department, made the presentation on behalf of the City office staff, men of the City sub-stations, and friends in the head office, and Mr. Cooch suitably acknowledged.

Accrington Electricity Committee has renewed the engagement of MR. WHITTLE as canvasser for a further 12 months at his present salary.

The Bath Electric Lighting Committee has recommended the increase of the salary of the engineer (MR. F. TEAGUE) from £550 to £600 per annum.

MR. JAMES SLEVIN has been appointed borough electrical engineer of Wigan (instead of electrical and tramways engineer), as from August 1st next, at a salary of £400 per annum, with house, coal and light. This appointment has been made in consequence of the desire of the Council that the electrical engineer should now devote the whole of his time to the electricity undertaking. The Tramways Committee has been instructed to take the necessary steps to appoint a tramways manager.

The Brighton T.C. has decided to increase the salary of MR. JOYCE, assistant manager of the electricity works from £300 to £325, with a further increase a year hence to the maximum of £350; that of MR. CLAUGHTON, assistant engineer, from £350 to £375, and at the end of the year to a maximum of £400; and that of MR. T. HENWOOD, mains engineer, from £205 to £220, and a year hence to a maximum of £250.

The Manchester Electricity Committee has fixed the commencing salary of MR. W. DUNDAS, resident engineer at the city stations, at £325 per annum; and the commencing salaries of MR. J. H. NIVEN and MR. E. ATKINSON, shift engineers, will be £171, rising in each case to £190 at the end of 12 months' satisfactory service. The Committee has appointed MR. H. W. SAUNDERS as draughtsman, at £225 per annum.

MR. WAMPACH has been appointed chief assistant engineer at the works of the Folkestone Electricity Supply Co., Ltd.

Tramway Officials.—The Coventry Tramways Committee has recommended the City Council to increase the salary of MR. T. R. WHITEHEAD, engineer and manager, from £450 to £500 per annum.

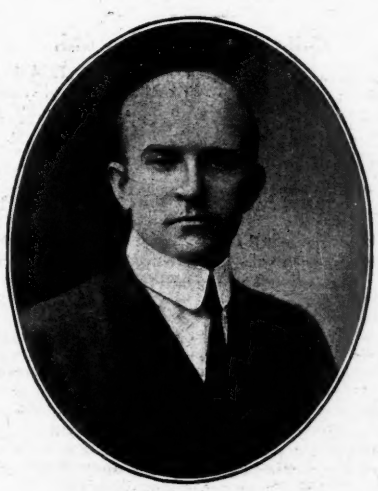
The Rotherham Corporation has appointed an Officials' Salaries Committee, to consist of nine members of the Council. A scheme of graded salaries in the various official staffs has been prepared, and amongst the minimum salaries fixed that of the tramways manager and electrical engineer is £600, with three weeks' summer holiday.

On Friday last, MR. G. GROVES, the manager of the Worcester tramways, was married to Miss Ethel J. Walter, daughter of the late Mr. J. Walter, Worcester. Amongst the presents was one from Mr. H. S. Day, chairman of the company, and one from the tramway staff.

The staff of the South Lancashire Tramway Co. have presented a gold watch, suitably inscribed, to MR. S. DEAN, the secretary of the sick club, who has left to become the manager in the sales department of a Liverpool firm.

An Australian newspaper states that MR. ALEXANDER CAMERON has been requested by the Prahran-Malvern (Vic.) Tramway Trust to devote his whole time to the service of the trust, and has agreed. The salary will be £900 per annum.

General.—DR. A. S. MCALLISTER, President-Elect of the Illuminating Engineering Society, U.S.A., was born at Covington, Virginia, in 1875. He received at the Pennsylvania State College, in 1898, the degree of B.S. and subsequently the degree of E.E. For several years later he was connected with the Berwind-White Coal Mining Co. at Windber, Pa., devoting his time to electric lighting and electric locomotive operation and repair. The following year he spent in the factory of the Westinghouse Electric and Manufacturing Co., studying the manufacturing details of direct-current and alternating-current machinery. He took a post-graduate course at Cornell University in physics and electrical engineering, and received the degree of M.M.E. in 1901. Four years later he received the degree of doctor of philosophy. From 1901 to 1904 he was an assistant and instructor in physics and applied electricity at that institution. In 1904 he became acting assistant professor of electrical engineering. In 1905 he became associate editor of the *Electrical World*, of which journal he is now editor-in-chief. Since 1909 he has been professional lecturer on electrical engineering at the Pennsylvania State College. Dr. McAllister is the



author of a book entitled "Alternating-Current Motors" (1906); chapters on "Transformers" and "Motors" in the "Standard Handbook for Electrical Engineers," and he has filed several patents for alternating-current machinery. He has also contributed many articles on engineering subjects to the technical Press and the transactions of scientific and commercial organisations. Prior to his election to the presidency, he had been a director for three years and an active member of several committees of the Illuminating Engineering Society. Dr. McAllister is a Fellow of the American Institute of Electrical Engineers, and a member of the American Association for the Advancement of Science, the American Electrochemical Society, the National Electric Light Association, the New York Electrical Society, the Society for the Promotion of Engineering Education, the Illuminating Engineering Society, the Sigma Xi, Phi Kappa Phi, and Eta Kappa Nu fraternities, and a number of prominent social clubs and organisations.

It is announced at the Massachusetts Institute of Technology that the Romford medal of the American Academy of Arts and Sciences has been awarded to WILLIAM DAVID COOLIDGE, assistant director of the Research Laboratory of the General Electric Co. at Schenectady. The award was made for his invention of ductile tungsten and its application in the production of radiation.

MR. WILLIAM STONE, who has been connected with the Japan Department of Communications since 1873, has been granted an Order of First Grade as a special honour in recognition of his services to Japan during the past 41 years. His services in the negotiations for the reduction of the rate on foreign telegraph messages, and for the purchase of telegraph lines from foreign concerns, are understood as being the most distinguished of all. Mr. Stone is one of the oldest Britishers in Japan still in active service.

The Freedom of the City of Newcastle-on-Tyne is to be conferred upon the HON. SIR C. A. PARSONS, K.C.B., F.R.S., to-day at Newcastle-on-Tyne.

The Civil List Pensions announced last week included one of £100 to DR. OLIVER HEAVISIDE, F.R.S., in addition to his existing pension, in recognition of the importance of his researches in the theory of high-speed telegraphy and long-distance telephony. MRS. JESSIE GRAY figures in the list with a pension of £50, granted in July last year. She is the widow of the late Mr. John Gray, so well known to members of the British Association and to ourselves and readers of the REVIEW. The grant was made in recognition of her late husband's valuable contributions to the science of anthropology, and in consideration of the circumstances in which she was left by his death. A third appearing in the list is MISS KATE BABB HEARDER, who is granted a pension of £70 in consideration of the contributions to electrical science and telegraphy of her late father, Dr. Jonathan Nash Hearder, and of her straitened circumstances. MRS. ANNIE WALLACE, widow of the late Dr. Alfred Russel Wallace, O.M., LL.D., F.R.S., has been granted a pension of £120 in consideration of the eminent services rendered to science by her husband, and of her inadequate means of support.

According to a Sheffield paper, MR. ARTHUR SMITH, electrical engineer to the contractors for the recently opened King George Dock at Hull, has accepted the post of electrical engineer under the Sheffield Corporation for its new waterworks undertaking at Bolsterstone.

MR. JAS. ROBERTS, foreman electrician at the Fenton Collieries, Ltd., who is leaving to take up an appointment at a South Yorkshire Colliery, has been presented by his colleagues with a gold signet ring.

MR. C. O. GABY, of the London office of Messrs. Saxby & Farmer, has secured the appointment of an electrical engineer in Southern India.

The marriage took place at St. Paul's Church, Bedford, on July 2nd, of MR. THOS. BRITTEN, manager of the Arc Electrical Works, Chelmsford (Messrs. Crompton & Co., Ltd.), son of Mr. Arthur Britten, of Great Billing, Northants, and Miss Edith J. Wells, youngest daughter of the late Mr. Charles Wells, and of Mrs. Wells, of Newnham House, Bedford.

At Ospringe (Kent) Parish Church on July 1st, the marriage took place of MR. JOHN SACKVILLE GOLDEN, of the Knole, Charing, near Ashford (Kent), and Miss Frances Mary Louise Tett, only daughter of the late Mr. Henry Seymour Tett, J.P., of Whitehall House, Ospringe, the founder and head of the firm of H. S. Tett, Ltd., electrical engineers, of Faversham and Sittingbourne.

MR. H. V. SCHOFIELD, of the staff of the Newcastle and District E.L. Co., at Close Power Station, and formerly of the Whitby Electricity Works staff, has been appointed battery inspector to the Chloride Electrical Storage Co., Ltd., of Manchester.

MR. H. BEDSON, of the electrical engineering department of the London County Council Paddington Technical Institute, Saltram Crescent, W., has been appointed Assistant Lecturer in Engineering under the Staffordshire County Council.

MR. W. H. BLYTHE, the first holder of the Bacup Mechanics' Institute Scholarship, has obtained the Certificate of Distinction in Electrical Engineering at the Manchester University. For the last year of his tenure he had been engaged in research work on "The Cooling Constants of Turbo-Generators," which resulted in considerable alterations being made to a £40,000 turbo-generator at present in course of erection in Sweden. Mr. Blythe is only the second man to hold such a certificate.

According to the *Times*, the Postmaster-General announces, in the Official Circular, that the Telegraph and Telephone Traffic Sections have been amalgamated, and MR. J. LEE, MR. W. H. A. NAPIER and MR. J. S. JONES become jointly telegraph and telephone traffic managers.

The British Insulated and Helsby Cables, Ltd., have appointed MR. G. E. MASON manager of the new branch which they are about to open in Leeds in the immediate future.

Obituary.—MR. FRANK SNOW.—A Chatham paper says that news has been received from Montreal, Canada, to the effect that Mr. Frank B. Snow, son of Mr. and Mrs. W. C. Snow, of Gillingham, passed away on the 27th ult. from scarlet fever. Mr. Snow was apprenticed at the Gillingham electric light works, and three years ago left England to join the Grand Trunk Railway as travelling electrical engineer of that company.

Will.—MR. JAMES HOWDEN, of Messrs. James Howden and Co., Ltd., Glasgow, who died last November, aged 81, left £388,252 personal, in addition to real estate.

NEW COMPANIES REGISTERED.

Telephone Co. of Pernambuco, Ltd. (136,737).—Registered June 30th, by Norton, Rose, Barrington & Co., 57½, Old Broad Street, E.C. Capital, £100,000 in £1 shares (55,000 7 per cent. cumulative preference). Objects: To acquire, construct, equip, develop, maintain, and work any lines of telephone, telegraph or other means of communication in Brazil or elsewhere, except the United Kingdom. The signatories (with one share each) are:—H. Harper, 10, Penerley Road, Catford, S.E., accountant; A. J. Medleycott, 86, Northumberland Park, Tottenham, N., clerk; M. P. Howell, 101, Croxted Road, West Dulwich, S.E., registrar; C. M. Plumtre, 77, Overhill Road, East Dulwich, S.E., clerk; F. R. Smethurst, 12, Egerton Gardens, Hendon, N.W., buyer to railway company; E. T. Washington, 1, Chaucer Terrace, Eltham, S.E., clerk; H. L. Hamlyn, 20, Rostrevor Road, Fulham, S.W., clerk. Minimum cash subscription seven shares. The first directors (to number not less than three or more than five) are to be appointed by the signatories. H. Tatham is first secretary; qualification, £1.

Trautmann's Patents Co., Ltd. (136,788).—This company was registered on July 2nd, with a capital of £40,000 in £1 shares, to take over the business of Trautmann Gesellschafft m.b.H., of Dresden, together with certain patents relating to electric or mechanical burglar alarms, to carry on the business of manufacturers of and dealers in the said alarms, signals and the like, experimenters in electrical and mechanical instruments and appliances, &c. The subscribers are:—E. Schneider, 11, Blasewitzer Strasse, Dresden, manufacturer, 100 shares; M. Trautmann, 11, Blasewitzer Strasse, Dresden, engineer, 100 shares; E. L. Leman, 28, Bishopsgate, E.C., engineer, 100 shares; F. Bedford, 85, Gracechurch Street, E.C., clerk, 1 share; A. G. Narris, 85, Gracechurch Street, E.C., clerk, 1 share; P. Werner, 85, Gracechurch Street, E.C., clerk, 1 share; W. S. Rouse, 85, Gracechurch Street, E.C., secretary, 1 share. Minimum cash subscription, £300. The number of directors is not to be less than three or more than nine; the first are E. Schneider, M. Trautmann and E. L. Leman; qualification, £100; remuneration, £150 each per annum (chairman £250). Solicitors, Cruesemann and Rouse, 85, Gracechurch Street, E.C.

Belco, Ltd. (136,797).—This company was registered on July 3rd, with a capital of £85,000 in £1 shares, to take over the business and all, or any, of the assets and liabilities of the British Economical Lamp Co., Ltd., at Windsor House, Kingsway, W.C., and to carry on the business of electrical engineers, manufacturers of electric lamps and fittings, suppliers of electricity, &c. The subscribers (with one share each) are:—Brigadier-General G. P. Bourcicault, 50, West Kensington Mansions, W.; R. Niepel, Windsor House, Kingsway, W.C., merchant. Private company. The number of directors is not to be less than two or more than seven; the first are Count Hutten (chairman), Brigadier-General G. P. Bourcicault, R. Niepel (managing director), J. Siess and L. Spiller (managing director); qualification, £250; remuneration, 8 per cent. of the net profits, divisible. Registered office, Windsor House, Kingsway, W.C.

"Krisco" Patents, Ltd. (136,705).—This company was registered on June 29th, with a capital of £500 in £1 shares, to carry on the business of sellers and distributors of the invention of A. Christmas and H. Christmas for improvements in connection with electric lamps for motor-driven vehicles, known as the "Krisco Magneto Light" (self-contained), to acquire the benefit of an agreement between the said vendors and F. W. Barnes, and all rights, privileges and personal property belonging to the said F. W. Barnes thereunder, and to adopt an agreement with the said F. W. Barnes and R. J. Rodd. The subscribers are:—F. W. Barnes, Rex House, St. Andrew's Square, Surbiton, engineer, 75 shares; R. J. Rodd, The Old House, Surbiton, Walton-on-Thames, electrical engineer, 75 shares; A. W. Love, 5, High Street, Walton-on-Thames, accountant, 26 shares. Private company. The number of directors is not to be less than three or more than five: the first are F. W. Barnes, R. J. Rodd and A. W. Love (all permanent, subject to holding 25 shares each); qualification of ordinary directors, £50 shares. Registered office, The Old House, Church Street, Walton-on-Thames.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Best's Safety Lamps, Ltd.—Particulars of £4,000 debentures, created May 28th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £3,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Joseph Collis, Ltd.—Particulars of £4,000 first mortgage debentures, created by resolutions of May 29th and June 13th, and secured by trust deed dated June 13th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's property, present and future, including uncalled capital, and freehold land, messuages and premises in Strood, Kent, with plant and machinery thereon. The Capital and Counties Bank, Ltd., has been appointed to have the custody of the deeds.

Particulars of £2,000 debentures, created May 29th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, subject to any outstanding debs. of a first series for £4,000. No trustees.

Electric Supply Corporation, Ltd. (52,036).—Capital, £250,000 in £5 shares. Return dated June 3rd, 1914; 42,000 shares taken up: £175,000 paid; £35,000 credited as paid. Mortgages and charges: £154,914.

Pontelec Welding Patents, Ltd.—Issue on June 19th, 1914, of £100 debentures, part of a series of which particulars have already been filed.

Winscombe Electric Light and Power Co., Ltd.—Particulars of £3,000 debentures, created November 8th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £2,190. Property charged: The company's property, present and future, including uncalled capital. No trustees.

Alexander Wright & Co., Ltd.—Particulars of £11,000 debs., created June 12th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £450. Property charged: The company's undertaking and property, present and future, except uncalled capital. No trustees.

West India and Panama Telegraph Co., Ltd. (11,116).—Capital, £2,445,630 in 34,563 first pref., 10,000 second pref. and 200,000 ord. shares of £10 each. Return dated June 11th, 1914. 34,563 first pref., 4,669 second pref. and 88,321 ord. shares taken up. £1,275,530 considered as paid. Mortgages and charges: £80,000.

Yorkshire (West Riding) Electric Tramways Co., Ltd.—Particulars of £21,000 debs., created May 20th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

River Plate Electricity Co., Ltd.—Trust deed, dated June 22nd, 1914, as substituted security supplemental to trust deed dated June 8th, 1903, securing £250,000 deb. stock, of which only £200,000 has been issued, charged on certain land in Argentine Republic, and company's undertaking and other assets. Trustees: River Plate Trust Loan and Agency Co., Ltd., 52, Moorgate Street, E.C.

Oriental Telephone and Electric Co., Ltd.—A memorandum of satisfaction to the extent of £1,600 on June 10th, 1914, of debenture stock covered by trust deed dated June 28th, 1905, and deed of acknowledgment dated June 12th, 1907, securing £200,000, has been filed.

Telephone Co. of Egypt, Ltd.—A memorandum of satisfaction to the extent of £1,674 on June 10th, 1914, of debenture stock covered by trust deed dated July 27th, 1904, and deeds of acknowledgment dated February 21st, 1906, March 4th, 1908, and October 27th, 1909, securing £200,000, has been filed.

Carrara-Versilia Electric Railway and Power Co., Ltd.—Charge on concession and right under the Convention with the Province with Province of Lucia, Italy (dated October 22nd, 1911), and the company's undertaking and property, present and future, including uncalled capital, dated May 25th, 1914, to secure £40,000. Holders: Commercial Bank of Scotland, Ltd., 62, Lombard Street, E.C.

Spencers, Ltd.—Particulars of £2,000 debs., created June 22nd, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £250. Property charged: The company's undertaking, present and future, including uncalled and unpaid capital. No trustees. Also issue on June 22nd of £1,000 debs., part of a series of which particulars have already been filed.

Liverpool Electric Welding Co., Ltd.—Particulars of £500 debentures, created June 18th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Fisher Humphreys & Co., Ltd.—Particulars of £12,500 first, and £4,000 second mortgage debentures, created June 25th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Cutting Bros., Ltd.—Particulars of £4,000 debentures, created July 7th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £3,800. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

A memorandum of satisfaction in full on July 15th, 1913, of debentures dated July 25th, 1911, securing £4,000, was also notified on June 23rd, 1914.

Hydro-Electric Concessions, Ltd.—Mortgage on uncalled capital dated June 29th, 1914, to secure £750. Holders: F. Chaplin and G. Robarts, 15, Lombard Street, E.C.

Pernambuco Tramways and Power Co., Ltd. (126,731).—Issue on June 16th, 1914, of £100,000 debs., part of a series of which particulars have already been filed.

Sheerness and District Electric Power and Traction Co., Ltd. (65,749c).—Issue on April 28th, 1914, of £80 debs., part of a series of which particulars have already been filed.

CITY NOTES.

Chile Telephone Co., Ltd.

IN their report for the year ended March 31st, 1914, the directors state that the aggregate number of subscribers at all centres at the end of the year was 13,975, a gain of 1,324 for the year. The gross revenue in Chile from all sources was, $3,157,003, an increase of $320,453; the expenditure in Chile was, $1,620,821, an increase of $244,406; the net income in Chile from all sources was, $1,536,182, an increase of $76,048. The average rate of exchange for the year was 9·60d., as compared with 10·13d. in the previous year, giving a decrease for the year of 0·53d. Converted into sterling at these rates, the net income was £61,454, a decrease of £169. The liquid assets and liabilities in Chile on March 31st, 1914, were valued at 9½d., the current rate of exchange on that day, as compared with 10d. at which they were valued on the corresponding date of the previous year. The balance to the credit of the revenue account, including £3,901 brought forward, is £61,146, of which £15,683 has been expended on replacements, &c., of plant, and £15,106 carried to reserve. An interim dividend of 3s. per share, free of income-tax, was paid on January 16th, and the directors now recommend a final dividend of 5s. per share, free of income-tax, leaving £3,956 to be carried forward. The board reports, with much regret, the death of Mr. Frank W. Jones, who was an original director of the company, and the retirement of the Hon. Herbert T. Allsopp, on account of ill-health.

The meeting is called for July 15th.

Underground Electric Railways Co. of London, Ltd.—At a meeting held in London last week, the resolutions passed relating to the conversion of the company into a holding company were confirmed.

Dublin United Tramways Co. (1896), Ltd.—Interim dividend for the half-year to June 30th, 6 per cent. per annum on the preference and 5 per cent. per annum on the ordinary.

British Electric Traction Co., Ltd.—A lengthy statement has been circulated by the directors to the preference and ordinary stockholders and the holders of income certificates, in which a scheme is advanced in detail for reducing the capital by £908,372.

Stock Exchange Notices.—Applications for the quotation of the following in the Official List have been made:—

Constantinople Telephone Co.—£200,000 6 per cent. obligation bonds of £100 each.

Lanarkshire Tramways Co.—Further 3,500 shares of £10 each, fully-paid.

City of London Electric Lighting Co., Ltd.—It is stated in the daily papers that the Streets Committee is advising the City Corporation that it would be inexpedient to execute the powers of purchasing the electric light companies in the City either this year or in 1915.

Aluminium Corporation, Ltd.—The resolutions referred to in our last issue were unanimously carried at the extraordinary general meeting held on July 1st.

General Electric Co., Ltd.

THE annual meeting was held on July 2nd at the Cannon Street Hotel, E.C., Mr. H. HIRST presiding.

In proposing the adoption of the report (ELEC. REV., p. 1083), the CHAIRMAN said he was happy to think that during the past twelve months the company had had its share of benefit from the wave of industrial prosperity which had swept over the whole world during the last few years. They showed again a progressive balance sheet and he thought their proposals as to how to deal with the results should prove to the shareholders that they realised that this pleasant state of affairs could not continue for ever, and they were making every possible preparation to face cheerfully and successfully more difficult times whenever they fell on the country generally or on the company in particular. The net trading profit for the past year was £157,894, as against £145,261 for 1913. Adding to this the balance brought forward they had to dispose of the respectable total of £190,225. Debenture interest absorbed £8,000; depreciation £24,328. The directors had put aside the same generous amount as in past years, but the state of the books permitted them to use out of this amount the sum of £10,000 for removal expenses which they must incur as soon as their Kingsway building was completed. They had provided £10,156 for managing director's and employees' bonus. He thought shareholders ought to know that the total bonus paid to employees was considerably larger, and the difference between the figures shown and the amount actually paid was defrayed out of revenue. They had put aside £14,000 towards writing off the expenses of the new issue of capital. This issue was not made during the year under review, but since its completion, but, as the commitments existed, he trusted they would agree that it was wiser to start meeting them at this moment. The rest of the allocations were similar to last year. The carry-forward was £4,000 more, and a further £3,000 appropriation to staff benevolence was still conditional. He was, however, in a position to announce that a scheme was practically completed, and he would probably be able to inform them next year that they had found it desirable to co-operate with the long-service members of their staff in a scheme of insurance with one of the leading insurance companies, which would probably free the amounts set aside for other purposes. The only outstanding feature of the balance sheet was that stock in trade and sundry debtors had again increased, but he would like to emphasise that, in spite of this increase, their proportion to the business done was smaller than in any previous year. The fact that the reserve fund now equalled the whole of the debenture issue was also worth noting. Those who watched the conservative and careful way in which they were disposing of their profits might wonder "Why all this care, what do they fear? what is at the back of it all?" He was happy to say that they feared nothing and that there was nothing at the back of it except a firm conviction in the continuance of electrical expansion. If they wished to share in this expansion and to retain the leading position, they would have to undertake and solve many problems, and they could not hope that everything they undertook would always lead to direct success. The possibilities were tremendous and they wished to give themselves every chance of attaining them, but beyond this they had recently undertaken a new and grave responsibility by increasing their capital. Their recent issue of £300,000 preference and £100,000 ordinary shares was a great success and showed confidence on the part of the public in the company. On that occasion they announced that a part of this money would go towards building central offices and warehouses in Kingsway. The contract for this building had been placed but, owing to the building strike, they had not been able to go ahead with it as yet. There might be delay before they could occupy it; when they did they would better be able to display their manufactures and they would also save the heavy expenses and the dislocation of trade caused at the present time by the carrying on of their London business in something like thirteen different buildings. A prominent feature of their business during the last few years had been the possession of the sole rights of the Osram lamp within the British Empire. By a large-minded arrangement between the leading firms of Germany, America, and this country, co-operation in research and laboratory experience was taking place. By that means they would participate, together with their friends, in every progress made by the joint and organised efforts of many hundreds of chemists and scientists throughout the world. It was extraordinary what rapid advances were being made. A few years ago the Osram was a delicate and brittle, though very efficient lamp. To-day the filament could be made of an unbreakable drawn wire of a diameter scarcely visible to the naked eye. During the past year the half-watt lamp had put in an appearance, and they were already doing a satisfactory business in half-watt Osrams. That was an incandescent lamp with the filament burning in nitrogen instead of in a vacuum. What further surprises might be in store for them through development in this direction he should not care to predict, but, partly from what he saw and partly intuitively, he felt that these surprises were very close ahead of them. The progressive results of this year's trading had been principally due to the expansion of their engineering and other departments. A certain class of the public identified them too much with the small electric supply business. It was true that that branch of electrical engineering had played an important part in the development of the company. It was also true that the growing demand for domestic electrical apparatus, including electric heating and cooking, would claim a considerable part of their capital and attention. But it was too little realised that the company to-day was in the front rank of those who supplied the world with large electrical machinery. They were making a particular study of large engineering units and they had realised that, in the future, electricity supply undertakings would tend in the direction of larger units, of high-speed turbines coupled to generators, or generators coupled to Diesel or slow-speed gas engines. They were producing machines up to 6,000 KW., and they hoped to go still further. So much for the generating of the current, but the application of this current offered an increasing field for enterprise. They now employed a number of specialists who could study and advise upon the problems of dock lighting and railway lighting, on the equipment of rolling mills, on the electrification of breweries, distilleries and spinning mills. In the past it had been the habit to build machines and let the various trades struggle for themselves as to how they could best make use of them. They realised the benefit to their clientèle as well as to themselves in providing able engineers to study the technical requirements of each particular trade. In this way they obtained the best results from special and particular machinery and were able to advise on the special arrangement of drives and grouping of machinery. Good results had already accrued from this policy, and they expected still better in the future. In a similar way they had made a close study of apparatus designed for the handling of heavy material, for instance, the handling of iron by magnets, and the development of winders and haulage gear for coal mines. They had always manufactured machinery which generated current; they had always manufactured machinery which applied and controlled current. The one hiatus had been that they had not manufactured the material which transmitted it. The last important development to which he wished to refer was the cable works at Southampton. These cable works would complete the circuit, and they would now manufacture everything electrical that could be manufactured. They found it essential that they should no longer be dependent for their cables and wires on the supplies from either competitors or foreign sources. The close relations which they had for years enjoyed with the firm of Messrs. Pirelli & Co., of Milan, one of the best and most importable cable-making concerns in the world, had led to a partnership agreement. They had, therefore, in conjunction with Messrs. Pirelli, formed a company for the erection of a cable factory at Southampton; for the present its capital consisted of £200,000, each party subscribing 50 per cent. The works were now completed and the machinery was being installed as rapidly as possible, and they hoped within a few months to supply cable and wire made at the Southampton factory of a quality and at a price that would compare favourably with that of any other firm. This review would show them that they were taking every step that might help to make them more powerful and more successful and less susceptible to conditions over which they had no control. It should, however, also justify their policy of building up large reserves and of a conservative division of profits. They had so many irons in the fire that, if they neglected to solidify the basis on which they rested they ran a risk of being too much disturbed by periods of depression, by strikes, and by the hundred and one unforeseen and unforeseeable troubles which would afflict any large organisation. With the care they were taking and with the provisions they had made, however, and under anything like normal conditions, he was looking forward to the future cheerfully and full of confidence.

Mr. E. G. BYNG seconded the motion, which was carried without any discussion.

Chilian Electric Tramway and Light Co., Ltd.

THE annual meeting was held on July 2nd at the offices, 1, London Wall Buildings, E.C., Mr. LUDWIG BREITMEYER in the chair.

In proposing the adoption of the report, as below, the CHAIRMAN said that at the last meeting he was able to present record figures, and he was pleased to be again in the position of informing them that the year 1913 furnished another record. With regard to the tramways, although they had carried about seven million more passengers, owing to the fall in the rate of exchange and increased operating expenses the profit fell short of the previous year by about £23,000. The lighting and power department, however, had made good and remunerative progress, the receipts for the past year being 7,658,983 pesos, or an increase of 1,092,311 pesos over the preceding year, the resulting profit being more than sufficient to make up the decrease in the tramway profit. The hydraulic works were now in full working order and giving satisfactory results. The capital expenditure during the year amounted to £251,173, but considerable further expenditure had yet to be made to meet the growing demands on the business, and if they were to reap the benefits they must keep pace with its requirements.

Mr. HECTOR DE BACKER seconded the motion, which was adopted.

The report for the year ended December, 1913, says that after deducting interest and redemption of debentures, London office and other charges, there is a balance to the credit of profit and loss account of £163,557, plus £8,381 brought forward, making a total net balance of £171,938. From this amount £60,000 has been placed to renewals reserve account, and £7,000 to insurance suspense account. There remains an available bal-

ance of £104,938, out of which the directors now recommend the payment of a dividend of 6 per cent. on the preference shares for 1913, amounting to £39,000, also the payment of the following further dividends in respect of the arrears outstanding on these shares, viz., dividend of 1 per cent., the balance of the arrears for the year 1902 amounting to £5,500, the full dividend of 6 per cent. on account of the year 1903 amounting to £33,0000, and 3 per cent. on account of the year 1904 amounting to £18,000. This leaves a balance outstanding on this account of £146,000. The balance of £9,438 remaining to the credit of profit and loss account will be carried forward to next year. The average rate of exchange ruling during the year has declined from 10½d. to 9 25-32d. During 1913 the tramways carried 109,444,579 passengers, earning $9,765,669, as against 102,677,482 passengers, earning $9,114,551 in 1912, but owing to the heavy increase in the working expenditure the result is a decrease in the profit as against 1912 of $491,670. The lighting department again shows a gratifying advance over the previous year; the receipts during 1913 amounting to $7,658,983 as against $6,566,671 in 1912. Some small extensions on the track have been completed during the year, additional rolling stock acquired, and the enlargement of the power station has been commenced; the various improvements undertaken have involved an expenditure on capital account during the year of the sum of £251,273 15s. 4d. Mr. Carl Müller resigned his position as managing director of the company in December last. He will retain his seat on the board. Mr. S. W. Jameson was elected a director in February of this year.

Edmundsons' Electricity Corporation, Ltd.

The directors' report for the year ended 31st March, 1914, states that the business of the company continues to show steady progress. Gross trading profit has increased by £911, and dividends and interest have increased by £1,640, whilst the loss on working the local authorities' undertakings is reduced by £137. The net profit, after providing for administration expenses and for debenture stock interest and redemption amounts to £23,125, an increase of £4,226. After deducting the interim half-yearly dividend paid in January last on the cumulative preference shares, there remains a balance of £17,125, which the directors recommend should be applied as follows: Carried to reserve, £9,000; final half-yearly dividend for the year ended 31st March, 1914, on the cumulative preference shares, £6,000; carried forward, £2,125. During the past year the Cromer undertaking has been taken over by the company from the Cromer Urban District Council.

From the schedule showing capital expenditure and gross profits of subsidiary and other companies for the years 1912 and 1913, we extract the following:—

	Gross profit (before providing for capital charges and depreciation). 1913.	1912.	Lamps connected (equiv. 33-watt). 1913.	1912.
Alderley	£2,849	£2,842	27,823	24,898
Bromley	13,196	13,088	115,518	107,649
Folkestone	17,994	16,073	139,100	131,253
Guernsey	5,895	5,529	126,774	112,950
Isle of Wight	14,402	14,171	133,809	125,455
Ilfracombe	1,252	1,234	21,159	19,936
Lymington	2,058	1,896	20,394	18,610
Melton Mowbray ..	2,654	2,519	23,206	21,965
Newmarket	2,630	2,559	29,729	27,811
North of Scotland ..	7,075	6,395	87,570	76,882
Ramsgate	3,892	3,619	40,478	37,519
Scarboro' Trams ..	730	377	—	—
Salisbury	5,783	6,346	43,881	41,621
Urban Co.	61,684	54,265	760,319	677,495
Wycombe	6,242	5,730	65,259	63,505
Cromer	1,109	1,100	16,828	16,805
Dorking	2,643	2,290	24,141	21,908
Frome	1,446	1,499	48,991	43,745
Hamilton	3,640	3,639	67,368	58,427
Surbiton	*4,254	*4,637	*47,313	*42,518
	£161,228	£149,768	1,889,651	1,669,952

* Figures for year ended March 31st.

Total capital expenditure, 1913, £3,098,053; 1912, £3,001,669.

The meeting was held yesterday (Thursday).

South American Light and Power Co., Ltd.

The 11th annual general meeting was held on Thursday, at Dashwood House, E.C., Mr. T. P. Gaskell presiding.

In proposing the adoption of the report (Elec. Rev. p. 26), the Chairman said it would be seen that they had done much better last year than in the preceding 12 months. They might, in fact, have paid 7 per cent. instead of the 5 per cent. which they recommended, but unfortunately although the past year had been a good one they could scarcely hope that they would do better in the current year, if indeed they did as well. For the first nine months of the year under review they were making very much larger profits than in the corresponding period, their net profits increasing by about 15 per cent., but in the last three months their receipts were actually less than for the corresponding three months. Therefore when the question of the dividend came to be considered, although as he had said they had earned sufficient to pay 7 per cent., the board thought it would be more prudent to only pay 5 per cent. and to devote £3,000 of the profit towards repaying the expenses of the debenture issue made 18 months' ago. In a company like that it would be a great drawback if they paid a larger dividend one year and then found that they could not continue it. He hoped and believed that the shareholders would think that the board had acted wisely therefore in limiting the dividend to the 5 per cent. recommended in the report.

Mr. F. O. Smithers seconded the motion and the report was adopted without discussion.

In their report the directors state that the increase in the business has been as follows:—

	1912.	1913.	1914.
Arc Lamps, connected	639	733	813
8 c.p. Inc. Lamps, connected ...	46,530	52,234	56,142
Fans, connected	271	312	311
Motors	81	91	116
Customers	1,381	1,706	1,924

Electric and General Investment Co., Ltd.

The annual meeting was held on June 30th, at the offices, 1, Great Winchester Street, E.C., Mr. J. B. Braithwaite presiding.

In moving the adoption of the report (Elec. Rev., p. 1085), the Chairman said the record of the year was a very simple one. They had earned £15,282, as compared with £14,797 last year; in other words they had earned approximately £500 more. They proposed to adopt the same conservative policy as last year and distribute £3,000 in dividends—that was the full 10 per cent. on the £20,000 paid up on the ordinary shares, and 6d. per share on the preference shares; to add £3,285 to their provision for contingencies, raising that fund to £84,000, and to carry forward a little over £3,000. It would be seen that the amount available for distribution was divided into about three equal parts; one was given to the shareholders, one was placed to the carry forward to ensure as far as possible the same dividend next year, and the larger balance was carried to the provision for contingencies. In addition to making that provision, they had during the year redeemed and cancelled £1,707 worth of debenture stock, so that the amount outstanding was only £17,863, as against the original sum of about £22,000. They would therefore see that the stock, which was the only thing which stood in front of the preference shares, was being steadily wiped out. He might say that there had been a good many difficulties of various kinds during the year, and on the whole he thought they were fortunate in having earned £500 more than in the preceding year. It would not be their policy to increase their dividends materially—certainly by not more than £1,000—until the reserve for contingencies was fully equal to depreciation on their investments, which was not quite the case at present. They had not quite reached the figure at which they could say that the depreciation on the investments was fully represented by the contingencies fund, but they were getting nearer to that position every year they added to the fund.

Mr. J. C. Bull seconded the motion, which was carried unanimously.

Marconi International Marine Communication Co., Ltd.

Commendatore Marconi presided at the Hotel Metropole on June 30th over the annual meeting.

In moving the adoption of the report (Elec. Rev. p. 1084), the Chairman said that the company had continued to make sound and substantial progress. The receipts from ships' telegrams, news services, rentals, etc., during the past year was £146,316, as compared with £100,322 in the preceding year, showing an increase in round figures of £46,000. On the other hand the expenses, although necessarily higher, had not increased out of proportion. The principal item of increase was shown under station expenses, which of course rose with the number of stations, and likewise the amount of depreciation. On the debit side of the balance sheet the issued capital had been increased to £306,084, and on the credit side, plant, apparatus, furniture, and stores, had increased to £213,000, which after making allowance for depreciation, showed an addition of £69,000, which was accounted for of course by the additional ships which had been fitted with wireless apparatus. It was a matter of great satisfaction to the directors, and, if he might be allowed to say so, especially to himself, to see this company now soundly on its feet, earning reasonable profits and paying a fair return to its shareholders, for he could not forget that when this company was registered in the year 1900, it had for its object the introduction of wireless telegraphy upon ships at sea to save life and to save ships, but with very few exceptions they found very little disposition to take advantage of the valuable services which they offered. In these days when many ships had been saved by means of wireless telegraphy, and thousands of people owed their lives to the fact that installations were on board most of the important ships, it would be scarcely believable to those of their shareholders who had not been thoroughly acquainted with the development of the company, that they expended something in the neighbourhood of £200,000 in creating and popularising their service before they were ever able to earn a profit. As a result, however, of the great energy of their staff and the hard work of every

member of the company, they were able this year for the fourth successive year to pay a reasonable dividend. He thought he was warranted in saying that the nation at large, if not the whole civilised world, owed respect at least to this company for the untiring and patient work which it had done in causing loss of life at sea to be so much less than it otherwise would have been; yet, notwithstanding, there were members of Parliament who never missed an opportunity of attacking their company and complaining of the monopoly which they alleged the company possessed. He would ask them if they could contend that they had turned that monopoly to an improper account. Did the history of the company suggest anything of the kind? Did the ten per cent. dividend which they were now able to declare, after nine years without any return at all for the capital invested, savour of extortion? Had they any knowledge or appreciation of the company's vast organisation? Did they know that every young man serving with them as a telegraph operator on board ship, and there were now some 1,500 of them, had been taught by them without charge; that not one of them had ever failed to do heroic duty, even to the sacrifice of his life when circumstances had called upon him to do so. There had never been any evidence that a ship in distress, fitted with a Marconi installation, had ever yet called for assistance without receiving an answer. In every important port throughout the world there was a Marconi inspector ready to overhaul the wireless apparatus of every ship that called, and they and the operators must work together under carefully considered rules which had to be most rigorously adhered to by the company to ensure the magnificent discipline so essential to the public and which prevailed throughout the service. Only a few days ago, Lord Mersey, as president of the court at present inquiring into the disaster which recently overtook the "Empress of Ireland," complimented the Marconi operators, and stated that they were a credit to the service to which they belonged, and innumerable were the letters of appreciation which were received by the company from all the important shipping companies throughout the country. He contended that it did not lie in the mouth of anybody to complain of the monopoly which the company possessed—if it possessed one—for it owed it to the invention, to an organisation and a perfect discipline, which were essential and could not exist were the business in many hands, and to the important capital which it had invested, so providing a valuable well conducted and reliable service to the whole travelling public, which it was very probable would never have existed at all but for the company's own efforts. In view of the bill which had been introduced into Parliament to carry into effect the International Convention for the Safety of Life at Sea, under which wireless telegraphy became obligatory upon ships carrying fifty persons or more including crew, the directors had consented to enter into an agreement with the Board of Trade to supply their installations in a similar way as they had done before whenever they might be called upon to do so. It was proposed that the remuneration which they were to receive should be left to a referee. Having regard to the very reasonable terms which the company had been in the habit of charging, the directors saw no objection to accepting these conditions. The directors had established, subject to the approval of shareholders, a superannuation fund, of which the North British & Mercantile Insurance Co. would act as trustees. This fund was for the purpose of providing pensions for employees of the company when they eventually retired from work. Similar funds had been brought into existence by other Marconi companies, and it was thought that it was highly desirable, now that this company had been placed on a sound profit-earning basis, to commence to make provision for employees upon their reaching the age of well-earned rest. The company and its employees would contribute jointly and in equal proportions to the fund, and the directors were of opinion that such a scheme was due to its employees, besides going a long way to encourage them to remain in the company's employ, and materially assisting therefore in maintaining the discipline of such pre-eminent importance in the responsible work which the company conducted.

Mr. GODFREY ISAACS (managing director) seconded the motion, which was carried without discussion.

The retiring directors were re-elected, and at an extraordinary meeting which followed, the shareholders agreed to an alteration in the articles of association to allow of the superannuation scheme being carried out.

Telephone Development Co. (1912), Ltd.—The report of the directors for the year ending June 30th, 1914, states that for the year ending June 30th, 1914, there is a balance to the credit of the revenue account of £16,078. A note in the revenue account shows that dividends to the further amount of £4,000 are estimated to have accrued within the period covered by the accounts. The company was incorporated on April 3rd, 1912. The directors now recommend that a dividend be paid at the rate of 5 per cent. per annum, calculated from the date of payment of the respective instalments on the shares, less income-tax. The payment of this dividend will absorb £14,742, leaving £1,336 available for the payment of directors' fees and carry forward to next year. Mr. J. E. Kingsbury offers himself for re-election as a director. It is proposed to change the name to the Telephone Development Co., Ltd.

Crompton & Co., Ltd.

THE directors, in their report to March 31st last, state that although the company was registered on June 19th, 1913, the business was taken over as from April 1st, 1913. The accounts now presented, therefore, cover a period of 12 months. The gross profit for the year is £48,672. After deducting general charges, depreciation, interest on debentures and other items, there remains an available balance of £13,551. Of this amount there has been set against the purchase price of the business, as representing approximately the profit earned up to June 19th, 1913, £2,970. The directors recommend that there be placed to general reserve fund £2,500; written off preliminary expenses, £1,500; dividend on the preference shares, at the rate of 5 per cent. per annum, £4,392; balance to be carried forward, £2,189. The directors have pleasure in reporting that the reconstruction of the company has had a beneficial effect on the business. All departments of the company are fully employed, and the outlook for the current year is promising. A technical difficulty raised by certain debenture holders of the old company has been overcome by a scheme continuing the debentures in force as debentures of the new company, the interest being increased to 5½ per cent. per annum. The scheme has been confirmed by the Court. Owing to pressure of other business, Mr. Lionel Hanbury retired from the board in October last. The Hon. Sir C. A. Parsons, K.C.B., has been appointed a trustee for the debenture-holders in the place of the late Sir Charles D. Rose, Bart.

The meeting is to be held on Monday next.

Continental.—FRANCE.—Among the new companies recently formed in France are:—The Société Regionale Electrique de Saone-et-Loire, formed at Lacrost (Saone-et-Loire), with a capital of £4,000; the Société Union Electrique de l'Auvergne et du Bourbonnais, Paris (149, Rue de Rome), with capital £9,000; and the Société des Forces Mortrices de la Vienne, Poitiers (33, Rue Renadet), with capital £100,000.

The report of the Société Lyonnaise des Forces Motrices du Rhone for the last financial year shows an available net profit of £57,666, which is being disposed of as follows:—To depreciation, £18,000; for renewal of plant, £20,000; to the shareholders, £8,400; to the holders of the founders' shares, £5,880; to the directors, £1,680; to the share reduction fund, £840, leaving a balance of £2,866 to be carried forward.

BELGIUM.—A profit of £3,495 is reported for the last financial year by the Antwerp Telephone and Electrical Works, of Berchem, Antwerp.

The report of the Société Internationale de Telegraphie Sans Fil, of Brussels, for the last financial year shows a profit of £8,058.

ROUMANIA.—The Electrica Co. (Lahmeyer), of Budapest, reports a net profit of £18,800 for the last year, as compared with only £16,816 in the preceding 12 months. The dividend is being increased from 8 to 9 per cent. The report of the Roumanian General Electric Co., of Budapest, a branch of the A.E.G., of Berlin, shows a net profit for 1913 of £6,276, as contrasted with only £3,597 in the preceding year. A dividend of 5 per cent. is being declared.

TURKEY.—The *Times* Brussels correspondent states that there was formed in Brussels on June 30th the Société des Tramways et Electricité de Constantinople, with a capital of 18 million francs, divided into 72,000 shares at 250 fr., for the purpose of becoming the principal shareholder in the Constantinople tramway concern, and obtaining a monopoly of electric lighting in Constantinople by agreement with the firm of Ganz, of Budapest. The formation of this company is the result of the Belgo-German group formed in September, 1911, which acquired the capital of the Metropolitan Railway, of Constantinople, from Galata to Pera. The chairmanship of the new concern has been entrusted to M. Heineman, director of the Société Financière des Transports, Brussels.

Japan.—The electric light companies in Tokio are just now suffering from the effects of severe competition, which is reflected in the reduced profits. Thus, the Tokio Electric Light Co., while again paying a dividend at the rate of 10 per cent. per annum for the last half-year, is only able to carry forward a sum of £13,621, as against £36,898 brought over from the last half-year. The available profit for the six months, including the sum just mentioned, was £220,821, out of which £9,200 is being placed to reserve, and £198,000 distributed in dividends.

Sheerness and District Electric Power and Traction Co., Ltd.—According to the *Financial Times*, the accounts for 1913 show a loss, after providing for debenture interest, of £1,805, thus converting a credit balance brought forward into a deficiency of £1,476.

Sao Paulo Tramway, Light and Power Co., Ltd.—The directors announce a dividend of 2½ per cent. on the capital stock.

Lima Light, Power and Tramways Co., Ltd.—The directors have declared a dividend of 1 per cent. for the quarter ended March 31st.

Telegraph Construction and Maintenance Co., Ltd.—The directors announce an interim dividend of 12s. per share.

Clontarf and Hill of Howth Tramroad Co., Ltd.—The directors announce an interim dividend of 3s. per share.

STOCKS AND SHARES.

Tuesday Evening.

AFFAIRS in the Stock Exchange seem to be looking up. It is necessary to use this tone of caution, because so many false starts have been made of late that mere habit of mind leads one to ask what will be the next unpleasant surprise to be sprung upon markets. There are various quarters from which a buffet or two may yet come, but the pronounced cheapness of money is forcing unfavourable factors to one side, and, by leading the bears of Consols a rare dance, infuses strength into all investment departments of the House.

Foreign banking firms report a large demand for money over the period when the big French National Loan will open its subscription-lists, so evidently the stags abroad are busily sharpening their antlers.

Investment it is which has led to rises in such shares as Charing Cross Electric Lighting Preference, City Preference and County Preference. People have had such painful experiences of foreign securities, in too many cases, that they are turning to such domestic issues as preferable from the safety standpoint, and with the available supply none too liberal, the present quiet demand makes itself felt upon quotations. The ordinary shares in the Electric Supply list are somewhat overlooked, and the common tendency towards lower prices which the summer brings, is noticeable in declines amongst St. James's, City Lights and Metropolitan Ordinary. Moreover, the absence of any supporting anticipation is making itself felt, in regard to which all that can be said at present is that movements are afoot which will fructify by-and-bye. Edmundson's report shows good progress, and the Preference are ⅛ up. Central Electric Debentures put on 1½ points.

Home Railway stocks ignore the latest labour outbreak at Woolwich Arsenal, and hang hopes and prices alike upon the rising of Consols. Steam stocks have risen appreciably within the past few days. Undergrounds kept pace with them. Metropolitans and Districts, with Metropolitan Surplus Lands, show substantial advances, but the Underground Electric Railways share group is dull, with falls in the £10 shares, though the bonds are better. The market rather fears the appointment of a Commission to inquire whether the motor-omnibuses or not are to contribute something to the upkeep of the roads. At Sheffield it was decided the other day that local omnibus services must pay for their running powers, and this plain hint has not been lost upon proprietors of the various issues connected more or less directly with the London General Omnibus Company. A sharp fall has lowered National Steam Car shares. Moreover, the parlous condition into which the London tramway business has drifted, renders it highly probable that new, vigorous competition may be expected from the L.C.C. trams. Large orders are recommended to be placed with the Brush Company for the supply of electric trailers to the trams, though the object of this is economy rather than competition.

London United Tramways Debenture stock and London and Suburban issues are unchanged on the week. Metropolitan Electric Trams First Debenture stock has shed a point.

Anglo-Argentine Trams First Preference shares at 4⅞ are better, but the Seconds have eased off ⅛, and at the middle price of 4¼ they give the handsome yield of 6½ per cent. on the money. United Electric Trams of Monte Video are down 5s. Brisbane Trams Investment Ordinary gained ½; there are vague rumours that the company is biding its time for a new issue of Debenture stock.

The Mexican stocks and shares are rather a better market. Irresponsible reports continue to credit the Niagara Conference with pacific intentions, and brisk rises in Mexican Railway stocks supplied a trifle of driving power to the utility descriptions. It takes little, however, to scare bullishness, and not all in the group show strength. Canadian generals are shaky, Common and Preferred shares both falling 2 points, but Shawinigans rose 4. Barcelona Tractions have dropped 2, to 21. Brazilian Tractions unsteadied on the news that the large loan which the Brazilian Government expected to raise, had been called off, for the time being, in consequence of negotiations breaking down.

Further depression in West India and Panamas is one of the features amongst cable shares. The Ordinary broke to 1 5/16, and the Preferences are dull. The market is still worried by the remnant of stale bull accounts in the shares. At the present price they should be worth looking up. Indo-Europeans are 10s. higher, and Telegraph Constructions gained 30s. at 38½. Advances have been secured by the Anglo stocks, Western Telegraphs, Eastern Ordinary, Globe Ordinary and Preference, while Commercial Cable Debenture has followed up its 2 points rise with another of 1½. The only dull spot, apart from West India and Panama shares, is Direct United States Cable, where the price is ⅛ easier.

The Marconi market has given way again. No other shares in the Stock Exchange are the sport of rumours to one-half the extent that Marconis are. Some of them, at least, must soon be laid to rest by the dividend announcement and the issue of the report. The net decline since last we wrote is 1 3/16. After the official close of business to-night, Tuesday, Marconis fell further to 2¼ sellers.

The British Electric Traction scheme for reorganising the capital account is now available. Its main feature is the proposed consolidation into two stocks of the present cumbrous capital, and the writing down the capital by £908,000. Upon first examination, the proposal looks a fair and equitable effort towards the various classes, and the market view is expressed by advances of 2 points in the 6 per cent. Preferred and the Deferred stocks, though the first Debenture fell 1. Stockholders are asked for their opinions on the proposals.

Willans & Robinson Preference has dropped 2, and Babcocks are 1/32 lower, the Preference 1/16 better. Manufacturing shares keep firm. Callenders are 2s. 6d. up. No change has occurred in Brush issues. General Electric New Ordinary are very firm at 30s. premium. The Crompton report was considered satisfactory. Rubber shares are a dull and stupid market, activity being held in suspense by the lumpishness of the raw material.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, July 8th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt	5/-	..
a ,, Nitric	,,	29/-	..
a ,, Oxalic	per lb.	2¾d.	..
a ,, Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	,,	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29	..
a Bleaching powder	,,	£6 5	..
a Bisulphide of Carbon	,,	£18	..
a Borax	,,	£17 10	..
a Copper Sulphate	,,	£21	..
a Lead, Nitrate	,,	£28 10	..
a ,, White Sugar	,,	£27 10	..
a ,, Peroxide	,,	£32	..
e Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (88/90 %) ..	per ton	£22 10	..
a ,, Chlorate	per lb.	3½d.	..
a ,, Perchlorate	,,	3½d.	..
a Potassium, Cyanide (98/100 %) .. (for mining purposes only)	,,	7½d.	..
a Shellac	per cwt.	65/-	5/- dec.
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers ..	,,	£8 10	..
a ,, Recovered	,,	£5 10	..
a ,, Lump	,,	£5 5	..
a Soda, Caustic (white 70/72 %) ..	,,	£10	..
a ,, Chlorate	per lb.	3¾d.	..
a ,, Crystals	per ton	£2 5	..
a Sodium Bichromate, casks ..	per lb.	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots ..	per ton	£86	..
b ,, Wire, in ton lots (1 to 14 S.W.G.)	,,	£107 6 8	..
b ,, Sheet, in ton lots ..	,,	£112	..
g Babbitt's metal ingots	,,	£50 to £221	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7¼d.	¼d. inc.
c ,, Tube (brazed)	,,	9¾d.	¼d. inc.
c ,, ,, (solid drawn) ..	,,	7¾d.	¼d. inc.
c ,, Wire, basis	,,	7½d.	¼d. inc.
c Copper Tubes (brazed)	,,	9¾d.	¼d. inc.
c ,, ,, (solid drawn) ..	,,	9¾d.	¼d. inc.
g ,, Bars (best selected) ..	per ton	£78	£1 inc.
g ,, Sheet	,,	£78	£1 inc.
g ,, Rod	,,	£78	£1 inc.
d ,, (Electrolytic) Bars ..	,,	£64	..
d ,, ,, Sheets ..	,,	£82 10	..
d ,, ,, Rods ..	,,	£70	..
d ,, ,, H.C. Wire	per lb.	8½d.	..
f Ebonite Rod	,,	4/6	..
f ,, Sheet	,,	4/-	..
a German Silver Wire	,,	1/6	4d. dec.
h Gutta-percha, fine	,,	6/10	1/2 dec.
h India-rubber, Para fine	,,	2/10	½d. inc.
j Iron Pig (Cleveland warrants) ..	per ton	51,8½	¼d. inc.
l ,, Wire, galv. No. 8, P.O. qual.	,,	£14	..
g Lead, English Pig	,,	£19 15	2/6 dec.
m Manganin Wire No. 23	per lb.	4/6	..
g Mercury	per bot.	£6 15	5/- dec.
c Mica (in original cases) small ..	per lb.	6d. to 8s.	..
c ,, ,, ,, medium	,,	8/6 to 6/-	..
c ,, ,, ,, large ..	,,	7/6 to 11/-	..
o Nickel, sheet, wire, &c.	,,	8/6 to 4/6 nom	..
p Phosphor Bronze, plain castings	,,	1/1 to 1/3½	..
p ,, ,, rolled bars & rods	,,	1/0½ to 1/2	..
p ,, ,, rolled strip & sheet	,,	1/2½ to 1/5½	..
c Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	10½d.	..
r Steel, Magnet, in bars	per ton	£95	..
g Tin, Block (English)	,,	£146 10 to £147 10	£5 10 inc.
n ,, Wire, Nos. 1 to 16	per lb.	2/3	..
p White Anti-friction Metals ..	per ton	£14 to £194	..
k Zinc, Sh's (Vieille Montagne bnd.)	,,	£25 2 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edwards Mill & Co.
j Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Prospectus.—*Barcelona Traction, Light and Power Co., Ltd.*—The list was to close last Saturday in an offer for sale of £3,118,060 5 per cent. first mortgage 50-year bonds in this company, of which Dr. F. S. Pearson is president, and Dr. H. F. Parshall is a director. The offer was made at the price of 82½ per cent.

SHARE LIST OF ELECTRICAL COMPANIES.

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations July 7th.	Rise + or Fall —	Present Yield p.c. £ s. d.
	*					
Bath Trams, Pref. Ord.	1	Nil	..	7/32 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	3/4 — 13/16	..	6 18 4
Do. 4½ % Deb.	100	4½	4½	70 — 75	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	15½ — 17½	+2	..
Do. Do. Deferred	100	..	..	8 — 10	+2	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	85 — 89 xd	..	6 11 2
Do. 7 % Non-Cum. Pr'f.	100	3	3½	53 — 56 xd	..	5 18 8
Do. 5 % Perp. Deb.	100	5	5	91 — 93	—1	5 7 5
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 79	..	5 14 0
Central London Railway, Ord.	100	3	3	57 — 62	..	4 16 9
Do. Gtd. Assented	100	..	4	82 — 84	..	4 15 8
Do. Pref.	100	4	4	68 — 73	..	5 9 7
Do. Gtd. Assented	100	..	4	84 — 86	..	4 18 0
Do. Def.	100	2	2	40 — 45	..	4 9 0
Do. Gtd. Assented	100	..	4	80 — 83	..	4 17 7
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	95 — 97	..	5 3 1
Do. Do. 1895	100	5	5	91 — 94	..	5 6 5
Do. Do. 1901	100	5	5	89 — 92	..	5 8 8
Do. Do. 1908	100	5	5	89 — 92	..	5 8 8
Do. 4 % Deb.	100	4	4	86 — 88	..	4 11 0
Hastings Trams, 6 % Pref.	1	6	6†	13/16 — 15/16	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	65 — 70	..	6 8 7
Isle of Thanet Trams, 5 % Pref.	5	2½	3	2 — 2½	..	6 0 0
Do. 4 % Deb.	100	4	4	71 — 76 xd	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	84½ — 86½ xd	..	5 15 4
London and Suburban, Ord.	1	..	..	1/32 — 3/32	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	3/4 — 13/16	..	8 0 0
Do. Do. 4½ % 1st Deb.	100	4½	4½	74 — 79 xd	..	5 14 0

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations July 7th.	Rise + or Fall —	Present Yield p.c. £ s. d.
	*					
London Elec. Railways, 4 % Deb.	100	4	4	88 — 90	..	4 9 0
London United Trams, 4 % Deb.	100	4	4	54 — 58 xd	..	6 18 0
Metropolitan Railway Consol.	100	1½	1½	41½ — 42½	+1½	3 17 10
Do. Surplus Lands	100	2½	2½	61 — 63	+2	4 7 4
Do. 3½ % Deb.	100	3½	3½	87 — 89	..	3 18 7
Do. 3½ % Pref.	100	3½	3½	82 — 84	..	4 3 4
Do. 3½ % Con. Pref.	100	3½	3½	79 — 81	..	4 6 4
Metropolitan District Ord.	100	Nil	..	26 — 26½	+1½	Nil
Do. 6 % Deb.	100	6	6	186 —189	..	4 6—0
Do. 4 % Deb.	100	4	4	91 — 93	..	4 6 0
Do. 4 % Prior Lien	100	4	4	96 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	83 — 86	..	5 4 8
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	84 — 87	—1	5 3 6
Do. 5 % Deb.	100	5	5	85½ — 88½	..	5 18 0
Potteries, Ord.	1	3½	3½	7/32 — 1/4	..	8 12 10
Do. 5 % Pref.	1	5	5	7/32 — 1/4	..	7 13 8
Do. 4½ % Deb.	100	4½	4½	83½ — 84½	..	5 6 2
South Metro. Trams, 4 % Deb.	100	4	4	64 — 68 xd	..	5 17 8
Underground Elec. Railways	10	..	..	3½ — 3¾	— 1/8	Nil
Do. "A"	1/-	..	..	1/16 — 3/32	..	Nil
Do. 6 % First Cum. Inc. Deb.	100	6	6	116 —118	+1	5 1 7
Do. 4½ % Bonds	100	4½	4½	98 —100 xd	..	4 10 0
Do. 6 % Income	100	6	6	90½ — 91½	+ ½	6 11 2
Yorkshire (West Riding), Ord.	5	Nil	Nil	1/2 — 9/16	..	Nil
Do. 6 % Pref.	5	3	4	4 — 4½	..	4 9 0
Do. 4½ % Deb.	100	4½	4½	88 — 86 xd	..	5 4 8

ELECTRIC RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4¾ — 5	+1/16	5 10 0
Do. 2nd Pref.	5	5½	5½	4¼ — 4¾	— ⅛	6 5 9
Do. 4 % Deb.	100	4	4	91 — 93 xd	..	4 6 0
Do. 4½ % Deb.	100	4½	4½	98 — 99 xd	..	4 11 0
Do. 5 % Deb.	100	5	5	95 — 97	+ ½	5 3 0
Auckland Trams, 5 % Deb.	100	5	5	101 —104 xd	..	4 16 8
Bombay Elec. S. & Trams, Pref.	10	6	6	11 — 11¾	..	5 2 2
Do. 4½ % Deb.	100	4½	4½	94 — 96 xd	..	4 18 9
Do. 5 % 2nd Deb.	100	5	5	100 —102	..	4 18 0
Brazilian Traction, Light and Power	$100	6	6†	77⅞ — 79⅞	— ⅛	7 11 0
Brisbane Trams Invt., Ord.	5	8	8	7 — 7⅛	+ ⅛	5 6 8
Do. 5 % Pref.	5	5	5	4⅜ — 5⅛	..	4 15 8
Do. 4½ % Deb.	100	4½	4½	98 —100 xd	..	4 10 0
B. Columbia Elec. Rly., Def.	100	8	8†	106½ —110½	—1½	7 4 10
Do. Pref. Ord.	100	6	6	103 —107	..	5 12 1
Do. 5 % Pref.	100	5	5	105 —108	..	4 12 7
Do. 4½ % 1st Mort. Deb.	40	4½	4½	98 —101	..	4 9 0
Do. 4½ % Vancouver Deb.	100	4½	4½	94 — 98	..	4 12 0
Do. 4½ % Con. Deb.	100	4½	4½	95½ — 97½	..	4 7 2
Calcutta Trams, Ord.	5	7½	9‡	6⅜ — 7	..	6 15 9
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	+ ⅛	4 17 7
Do. 4½ % Deb.	100	4½	4½	97 —100	+1	4 10 0
Cape Electric Trams	1	5	5	3/4 — 13/16	..	6 18 4
City Buenos Aires Trams (1904)	5	5	5	5½ — 5¾	+1/16	4 11 0
Do. 4 % Deb.	100	4	4	95 — 100 xd	..	4 0 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	91 — 95	..	5 5 3
Havana Elec. Rly., 5 % Bonds	$1000	5	5	93½ — 97½	..	5 2 6
Kalgoorlie El. Trams 5% A Deb.	100	5	5	82 — 87	..	5 15 0
Do. 6 % B Deb.	100	8	..	10 — 20	..	Nil

La Plata Elec. Trams, Ord.	1	..	..	1/32 — 3/32	..	..
Do. Pref.	1	4½d.	6	3/16 — 7/32	..	6 5 0
Lisbon Elec. Trams, Ord.	1	6	6	1 3/32 — 1 1/16	..	4 9 3
Do. 6 % Pref.	1	6	6	1 1/16 — 1 1/8 xd	..	5 3 3
Do. 5 % Deb.	100	5	5	92½ — 97½ xd	..	5 2 6
Madras Elec. Tr., 6 % Cum. Pref.	5	6	6	4⅝ — 5¼	..	5 14 3
„ Elec. Tr. (1904), Deb.	100	5	5	98 —101 xd	..	4 19 0
Manaos Trams & Lt., 1st Deb.	100	5	5	75½ — 78½ xd	..	6 7 5
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98½ —100½	..	4 19 6
Mexico Trams Com	$100	7	7	72 — 76	..	..
Do. Gen. Con. 5 % Bonds	..	5	5	80 — 84	..	5 19 1
Do. 6 % Bonds	100	6	6	74 — 78 xd	..	7 13 10
Para Elec. Rlys. & Lt., Ord.	5	10	10	4 — 4½	..	11 2 2
Do. 6 % Pref.	5	6	6	4 — 4½	..	6 13 4
Do. 5 % 1st Deb.	100	5	5	87½ — 90½	..	5 10 8
Rangoon El. Tr. & Sup., Pref.	5	6	6	4⅝ — 5⅛ xd	..	5 11 7
Do. 4½ % 1st Deb.	100	4½	4½	94 — 96 xd	..	4 13 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	97½ — 99½ xd	..	4 19 6
Do. 5 % Mort. Bonds	100	5	5	90 — 92	..	5 8 8
Sao Paulo Tram., Lt. and P., 5 % 1st Deb.	$500	5	5	97 —101	..	4 19 0
Singapore Trams, 5 % Deb.	100	5	5	88 — 92	..	5 8 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95 — 97	..	5 3 0
Un. Elec. Trams Monte Video	5	7	7	4¼ — 4⅜	— ⅛	7 7 4
Do. 6 % Pref.	5	6	6	4⅝ — 5⅛	..	5 17 3
Do. 5 % 1st Deb.	100	5	5	93½ — 95½	..	5 3 8
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	93½ — 95½	..	4 14 8

ELECTRICITY SUPPLY AND POWER COMPANIES.—HOME.

Bournemouth & Poole, Ord.	10	6	7	10 — 11	..	6 7 4
Do. 4½ % Pref.	10	4½	4½	9½ — 10½	..	4 5 9
Do. Second 6 % Pref.	10	6	6	10½ — 11	..	5 9 1
Do. 4½ % Deb. Stock	Stock	4½	4½	93 — 96 xd	..	4 18 9
Brompton & Kensington, Ord.	5	10	10	8½ — 9½	..	5 8 1
Do. 7 % Cum. Pref.	5	7	7	8½ — 8¾	..	4 0 0
Central Electric Supply, 4 % Guar. Deb.	100	4	4	91 — 94	+1½	4 5 1
Charing Cross, West End & City	5	5	6	4⅞ — 5⅜	+ ⅛	5 11 7
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4½	..	4 12 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4 5/16 — 4 7/16	+ ⅛	4 18 8
Do. Do. 4 % Deb.	100	4	4	90½ — 92½	..	4 6 6
Chelsea, Ord.	5	5	5	4½ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	95 — 98 xd	..	4 11 0
City of London, Ord.	10	9	10	16 — 17	— ½	5 17 8
Do. 6 % Cum. Pref.	10	6	6	13 — 14	+ ½	4 5 9
Do. 5 % Deb.	Stock	5	5	115 —118 xd	..	4 4 9
Do. 4½ % Second Deb.	100	4½	4½	98 —101 xd	..	4 9 1
County of London, Ord.	10	6	7	11½ — 12½	..	5 14 3
Do. 6 % Pref.	10	6	6	11½ — 12⅝	+ ⅛	4 17 0
Do. 4½ % Deb.	Stock	4½	4½	101 —104 xd	..	4 6 7
Do. 4½ % Second Deb.	Stock	4½	4½	99 —102	..	4 8 1
Edmundson's, Ord.	£3	..	..	7/16 — 9/16	..	Nil
Do. 6 % Cum. Pref.	5	6	6	3¾ — 4⅛	+ ⅛	7 10 0
Do. 6 % Non-Cum. Pref.	5	..	..	1⅝ — 2	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	..	5 4 6
Folkestone	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % First Deb.	100	4½	4½	93 — 95	..	4 14 9

Hove	5	8	9	8¼ — 9	..	5 0 0
Kensington & Knightsbridge, Ord.	5	8	9	7⅜ — 7⅞	..	5 14 3
Do. 4 % Deb.	Stock	4	4	91 — 93	+1	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	76 — 80	..	5 12 0
London Electric, Ord.	3	2½	3	1⅜ — 1⅝	..	5 10 7
Do. 6 % Pref.	3	6	6	4¼ — 5¼	..	5 14 3
Do. 4 % First Mort. Deb.	Stock	4	4	91 — 94	..	4 5 1
Metropolitan	5	4½	4½	8¼ — 8⅝	— ⅛	6 4 2
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4½ xd	..	4 10 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	96 — 99 xd	..	4 11 0
Do. 3½ % Mort. Deb.	Stock	3½	3½	82 — 84 xd	..	4 3 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	+1	4 18 1
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9¼ — 10½ xd	..	5 17 3
Oxford	5	7	7	5⅞ — 6⅛	..	5 10 0
St. James' and Pall Mall, Ord.	5	10	12	9¼ — 9⅝	— ⅛	6 4 8
Do. 7 % Pref.	5	7	7	6¼ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	82 — 85 xd	..	4 2 4
South London, Ord.	4	5½	5½	2⅜ — 3½	..	6 10 4
Do. 5 % First Mort. Deb.	100	5	5	97 —100 xd	..	5 0 0
South Metropolitan, 7 % Pref.	1	7	7	1⅜ — 1⅝	..	5 6 8
Do. 4½ % First Deb. Stock	100	4½	4½	97 — 100	..	4 10 0
Urban, Ord.	£3	Nil	..	7/16 — 9/16	..	..
Do. 5 % Cum Pref.	5	3‡	4	2⅝ — 3	..	6 18 4
Do. 4½ % First Mort. Deb.	100	4½	4½	84 — 87	..	5 3 8
Westminster, Ord.	5	10	10	8¾ — 8¾	..	5 12
Do. 4½ % Cum Pref.	5	4½	4½	4 13/16 — 5 1/16 xd	..	4 6 9

* Unless otherwise stated, all shares are fully paid. † Interim Dividend. ‡ And Funded Certs.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued.)*

ELECTRICITY SUPPLY AND POWER—COLONIAL AND FOREIGN.

NAME.	Stock or Share.	Dividends for		Closing Quotations July 7th.	Rise + or Fall —	Present Yield p.c.
Adelaide, 6 % Pref.	£5	6	6	5⅛ — 5⅜	..	£ s. d. 5 11 7
Calcutta, Ord.	£5	8½	9	7⅛ — 7⅜	..	5 18 0
Do. 5 % Pref.	£5	5	5	5 1/16 — 5 1/16	..	4 14 1
Calgary Power, 1st Mort. Bds.	100	5	5	87 — 89 xd	..	5 12 3
Canadian Gen. El, Com.	$100	7	8	98 —103	..	7 15 6
Do. 7 % Pref.	$100	7	7	116 —121	..	5 15 10
Cordoba Lt., Power and T., Ord.	1	5	..	7/16 — ½	..	7 12 0
Do. 5 % Deb.	100	5	5	80 — 85	..	5 17 8
Elec. Lt. and P. of Cochabamba, 6 % Bonds	£80	6	6	81 — 83 xd	..	6 19 6
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	94 — 97 xd	..	5 3 1
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	93 — 95	— ½	5 5 3
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	3/16 — 3/8	..	Nil
Do. 6 % Pref.	£1	6	4	3/4 — 15/16	..	8 0 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	99 — 102 xd	..	4 18 0
Madras, Ord.	£5	Nil	..	1¼ — 1½	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	103 —106	..	4 14 6
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	58 — 63 xd	..	7 18 8
Mexican Lt. & Power, Common	$100	4	4†	46 — 49	..	..
Do. 7 % Cum. Pref.	$100	7	7	73 — 77	..	9 4 10
Do. 5 % 1st Mort. Gold Bds.	..	5	5	76 81	+1	6 3 5
Do. 5 % 2nd Mort. Bonds	100	5	5	59 — 64	..	7 13 3

NAME.	Stock or Share.	Dividends for		Closing Quotations July 7th.	Rise + or Fall —	Present Yield p.c.
	*	1913.	1913.			£ s. d.
Monterey Rly., Light & Power, 5 % 1st Mort. Deb.	100	5	5	48 — 53	—1½	..
Montreal, Lt., H. and Power	$100	9	10†	230 —235	..	4 5 1
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	5a	10 — 20	..	..
River Plate, Ord.	Stock	10	10	235 —245	..	4 1 8
Do. 6 % Non-Cum. Pref.	Do.	6	6	97 —103	..	5 16 6
Do. 5 % Deb. Stock	Do.	5	5	99 —101 xd	..	4 19 0
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital	$100	5½	6	137 —141	+4	4 5 1
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	103 —106 xd	..	4 14 4
Do. 4½ % Per. Deb.	Stock	4½	4½	100 —102	..	4 8 3
Toronto Power, 4½ % 1st Deb.	Do.	4½	4½	98 —100	+1	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	82½ — 84½ xd	..	5 18 4
Victoria Falls Power, Pref.	1	6	6	1/16 — 3/32 xd	..	8 0 0
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 3

MANUFACTURING COMPANIES.

Aron, Ord.	£1	7	7	3/32 — 1/8	..	8 0 0
Do. 6 % Pref.	£1	6	6	1/32 — 3/32	..	6 17 2
Babcock & Wilcox	£1	16	16	22 3/32 — 23 3/32	— 3/32	5 9 8
Do. Pref.	£1	6	6	1 3/32 — 1 5/32	+ 1/16	4 3 6
British Aluminium, Ord.	£1	..	5	1 3/32 — 1 5/32	..	4 14 1
Do. 6 % Cum. Pref.	£1	6	6	1 3/32 — 1 5/32	..	6 9 0
Do. 5 % Prior Liens Debs.	100	5	5	95 — 98 xd	..	5 2 0
Do. Deb. Stk.	100	5	5	90 — 95	..	5 5 3
B.I. & Helsby Cables	£5	10	13	9 3/32 — 9 7/32	..	6 11 8
Do. Pref.	£5	6	6	5 1/4 — 5 3/8	..	4 14 1
Do. Deb.	100	4½	4½	100 —103 xd	..	4 7 5
British Thomson-Houston, Deb.	100	4½	4½	92 — 94	..	4 15 9
British Westinghouse, Pref.	£2	Nil	5	1 3/8 — 1 7/16	..	5 6 8
Do. Deb.	100	4	4	73 — 76	+1	5 5 3
Do. 6 % Prior Lien	100	6	6	101 —104	..	5 16 6
Browett, Lindley, Ord.	£1	..	..	2/- —3/-	..	Nil
Do. Pref.	£1	..	..	3/- —3/6	..	Nil
Brush, 7 % Pref.	£2	Nil	..	0 — ½	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	80 — 85 xd	..	5 17 8
Do. 4½ % Deb.	100	4½	4½	52 — 57	..	7 17 10
Do. 4½ % Second Deb.	100	4½	4½	23 — 33	..	13 12 8
Callender's Cable	£5	15	15	11¼ — 12½	+ ⅛	6 2 5
Do. Pref.	£5	5	5	5 — 5¼	..	4 15 3
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Castner-Kellner	£1	20	22½	2 7/16 — 2 5/16	..	8 15 5
Do. Deb.	100	4½	4½	104 —107	..	4 4 1
Dick, Kerr	£1	Nil	..	3/32 — 1/8	..	..
Do. Pref.	£1	6	6	1/32 — 3/32	..	6 17 2
Edison & Swan, A, £2 paid	£5	Nil	..	3/32 — 5/32	..	Nil
Do. fully paid	£5	Nil	..	1 — 1 3/32	..	Nil
Do. 4 % Deb.	100	4	4	57 — 61	..	6 11 1
Do. 5 % Second Deb.	100	5	5	61 — 66	..	7 11 6
Electric Construction	£1	5	6	3/8 — 1 1/32	..	8 14 6
Do. Pref.	£1	7	7	1 — 1 3/32	..	6 4 5
Greenwood & Batley, Pref.	£10	7	7	6 3/32 — 7 1/32	..	9 18 2
Do. Deb.	100	5	5	92 — 94	..	5 6 6
General Electric, 6 % Pref.	£10	6	6	10 3/32 — 10 7/32	..	5 10 4
Do. Deb.	100	4	4	88 — 92	..	4 7 0
Henley's, Ord.	£5	15	20	14 1/32 — 15 1/32	..	6 9 0
Do. Pref.	£5	4½	4½	4 7/32 — 5 3/32	..	4 7 10
Do. Deb.	100	4½	4½	99½—101½	..	4 8 8
India-Rubber, G. & T.	£10	7½	7½	9½ — 10 1/32	..	7 2 10
Do. Pref.	£10	5	5	8 7/32 — 9 3/32	..	5 4 0
Telegraph Construction	£12	20	20	87½ — 89½	+ 1½	6 1 7
Do. Deb.	100	4	4	97 — 99 xd	..	4 0 10
Willans & Robinson, 4 % 1st Mort. Deb.	100	4	..	68 — 67	..	5 19 8
Do. B 4 % Cum. Pref.	100	..	£4	38 — 42	—2	9 10 6

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	£10	4½	4½	5⅝ — 6¼	..	7 4 0
Do. 5 % Deb. Red.	Stock	5	5	95 — 98 xd	+1	5 2 0
American Telep. & Teleg., Cap.	$100	8	8	121 — 125	—1	6 8 0
Do. Collat. Trust	$1000	4	4	91 — 94	+1	4 5 0
Anglo-American Telegraph	Stock	8	8	64 — 67	..	4 9 7
Do. 6 % Pref.	Do.	6	6	107⅜ — 108⅜	+ ⅛	5 10 7
Do. Def.	Do.	80/-	80/-	22⅞ — 23⅜	+ ⅛	6 8 4
Anglo-Portuguese Tel., 5 % Mort. Deb.	£100	5	5	102 —104	..	4 16 2
Chili Telephone	£5	8	6†	7⅛ — 7⅜	..	5 6 8
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	80½ — 82½	+1½	4 17 0
Cuba Telegraph	£10	6	6†	8 — 9	..	6 13 4
Do. 10 % Pref.	£10	10	10	16 — 17	..	5 17 8
Direct Spanish Telegraph, Ord.	£5	4	4	3½ — 4	..	5 0 0
Do. 10 % Cum. Pref.	£5	10	10	7⅛ — 7⅜	..	6 9 0
Direct United States Cable	£10	4	4	6⅛ — 6⅜	..	5 18 6
Direct W. India Cable, 4½ % Reg. Deb.	£100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	130 —133	+1	5 5 3
Do. 8½ % Pref. Stock	Do.	8½	8½	76 — 78	..	4 9 9
Do. 4 % Mort. Deb.	Do.	4	4	95½ — 97½	+ ½	4 2 1
Eastern Extension	£10	7	7	12⅜ — 13	..	5 7 9
Do. 4 % Deb.	Stock	4	4	95½ — 97½	..	4 2 1
Globe Telegraph and Trust	£10	6	6†	10⅜ — 11⅜	+ ⅛	5 5 8
Do. 6 % Pref.	£10	6	6	12⅜ — 12⅝	+ ⅛	4 13 1
Great Northern Telegraph	£10	20	20	81½ — 83½	..	5 19 5
Indo-European Telegraph	£25	13	13	67 — 69	+ ½	5 11 1
Mackay Companies Common	$100	5	5	83 — 85	..	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	67 — 70	..	5 10 1
Marconi's Wireless Telegraph	£1	20	20	2½ — 2⅝	— 1/16	7 13 4
Do. 7 % Cum. Partic. Pref.	£1	17	..	2⅝ — 2¾	— ⅛	7 11 2
Monte Video Telephone, Ord.	£1	6	6	1/2 — 17/32	..	6 8 0
Do. 5 % Pref.	£1	5	5	29/32 — 31/32	..	5 18 6
New York Telep., 4½% Gen. Bnds.	100	4½	4½	100½ — 101½	..	4 9 0
Oriental Telep. and Eleo.	£1	10	10	2 5/16 — 2 9/16	..	4 7 6
Do. 6 % Cum. Pref.	£1	6	6	1 29/32 — 1 31/32	..	4 18 5
Do. 4 % Red. Deb.	Stock	4	4	86 — 88 xd	..	4 11 0
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	96 — 98 xd	..	4 1 8
Reuter's	£10	10	7	7½ — 8½	— ½	8 9 8
Submarine Cables Trust	Cert.	6	6	127 —130	+1	4 12 4
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	97 — 99	..	4 11 0
United River Plate Telephone	£5	8	6†	6⅞ — 6⅞	— ⅛	6 0 9
Do. 5 % Cum. Pref.	£5	5	5	5 — 5⅛ xd	..	4 11 0
West Coast of America	2½	2½	N	⅞ — 1⅛	..	Nil
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	£100	4	4	96 — 99 xd	+1	4 0 10
West India and Panama Teleg.	£10	1½	1½	1 3/32 — 1 7/16	— 1/16	8 13 10
Do. 6 % Cum. 1st Pref.	£10	6	6	1 1/16 — 1 1/8	— ⅛	6 9 9
Do. 6 % Cum. 2nd Pref	£10	6	6	8½ — 8¾	..	6 16 9
Do. 5 % Debs.	£100	5	5	98 —101	+ ⅛	4 19 0
Western Telegraph, Ltd.	£10	7	7	18⅜ — 18⅞	+ ⅛	5 0 11
Do. 4 % Debs.	Stock	4	4	95½ — 97½	+ ½	4 2 1
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	94 — 97	..	4 12 9

* Unless otherwise stated all shares are fully paid. † Interim dividend. a Paid in deferred interest warrants.

Bank rate of Discount 3 per cent., January 29th, 1914.

Water-power Congress.—The second White Coal (Houille Blanche) Congress, noticed in our issue of June 19th, will be held, not at Paris—as stated in our previous note—but at Lyons, and will cover three days (September 7th to 10th), followed by four days' excursions (September 11th to 14th) to hydraulic installations on the Alps. To the legislation section are appended an economic and technical section, and among the questions treated will be the following:—Economic results expected from the utilisation of the Rhone (M. E. F. Cote, a director of the Houille Blanche Congress); the rôle of reservoirs in the regulation of water-courses (Mr. Wilhelm, Ingénieur des Ponts et Chaussées at Grenoble); the intervention of the State in the development of "Houille Blanche"; financial burdens affecting private water-power and those powers granted by the State, departments and communes; the economic progress and local benefits to which valleys at the foot of mountains have a right by the development of their water-power sources; useful undertakings for the bettering of the distribution of water; "white coal" and metallurgy; "white coal" and the electrical working of railways; "white coal" and agriculture. In the technical section the subjects treated will be:—Installation of water-power works in France and abroad, from the standpoint of canels, dams and stations—financial and economic programme; protection of banks; measurement of flow; water-hammer; the hydroelectric laboratory; high-pressure metal pipe lines; high-pressure cement conduits; turbines; equipment and protection of high pressure lines; and the importance and influence of the transport of energy. The excursions will embrace visits to the principal hydroelectric installations in the Alps of Savoy and Dauphiné.

REVIEWS.

Camp Co-operation: Book of Proceedings at Association Island, 1913. New York: The Roycrofters. Price $1.25.

At this moment, when the I.M.E.A. Convention has just been held, and when many pens are scratching their wielders' opinions on the late Industrial Committee, it is rather appropriate that this highly interesting book should make its appearance.

It may be well first to say that Association Island is in Lake Ontario, State of New York, that its attractiveness as a recreative vacation resort was noticed by a small group of electrical men about ten years ago, and that in 1907 the Association Island Corporation was organised and the island was purchased. It appears that now every year, workers in all sections of industry which may have any bearing upon electricity meet there, lead the simple life, and talk shop.

The record of the proceedings of 1913 is now under notice, and as a sample of the general high level of the contents we may mention that there are contributions from—we mention the names that are most likely to be known on this side—Mr. Samuel Insull, Dr. Charles P. Steinmetz, the Hon. John H. Roemer, of the Wisconsin Utility Commission; Mr. Frank Vanderlip, President of the National City Bank of New York; Mr. Joseph B. McCall, President of the Philadelphia Electric Co., and of the National Electric Light Association, who was the chairman of the gathering; Dr. Thomas Darlington, the Hon. Willard Howland, of the Legislative Assembly of Massachusetts, and many others whose renown is no doubt equally great in their own country.

The subjects discussed cover an enormously wide field, and give much food for thought. Co-operation is, of course, the key-note of all the addresses delivered as well as of the speeches made in discussion. Mr. Insull treats of the Distribution of Electrical Energy, Present and Future; Dr. Steinmetz of the Future Technical Development of the Electrical Business; other members deal with co-operation among manufacturers, the Society for Electrical Development, co-operative advertising in regard to electric vehicles, and the co-operative organisation of the Illuminating Engineering Society—and it may here be noted, as exemplifying the extent to which the co-operative idea extends, that this is not a society of illuminating engineers, but "a society to provide for a closer co-operation on matters pertaining to the use of light among laymen as well as professionals; among electrical engineers, gas engineers, architects, and designers of fixtures and glassware; to point out in what way the best illumination results may be obtained from any source of light."

Then there are important papers on Favourable Conditions for Labour (we refuse to leave the "u" out), by Dr. Darlington; Financing Electricity, by Mr. Vanderlip; Government in relation to Business, by the Hon. W. Howland; Principles of Resale Control, by Mr. F. P. Fish; and State Commission Control, by the Hon. J. H. Roemer. To get together men of such eminence, and to get them to give their experience of and opinions upon the matters with which they are most intimately concerned, and so to contrive that the bearing of finance, medicine, and political administration upon electricity and its progress is brought into effective prominence, is in itself no mean achievement.

Mr. Chattock's presidential address to the I.M.E.A., dealing as it did with the possible nationalisation of electricity supply, and Dr. Ferranti's well-known views on the same subject, really mean that the need for co-operation is also realised over here. The existence of the B.E.A.M.A. among the manufacturers, of the E.C.A. among contractors, of the A.C.E. among consultants, and of other similar bodies, shows that each section of the industry is awake to the necessity that its members shall work together for the common good of all. Now, if we may digress for one moment and refer to Mr. Wordingham's article: "Should the Council be Blamed?" in our issue of May 29th last, we would, while thanking him for his timely emphasising of the fact that after all the engineering talent is the most necessary of all those which have been given to the industry as a whole—for the commercial man with no engineering knowledge can make a far worse hash of his undertaking than the engineer without commercial ability—say that there is surely only one step between the co-operative effort of members of a section and the co-operation of the sections together. There is no need to-day for Mr. Wordingham's "appeal to arms," and fighting "as often and as furiously as is necessary." The answer to this part of Mr. Wordingham's article is to be found under the frontispiece of this book, a portrait of the First Co-operator, viz.: "There never was a good war nor a bad peace."

We have deemed it our duty to deal more particularly with the book as a whole, and the general principle enunciated by it. Indeed, if we tried to comment upon each subject in detail, we should need the whole of this issue of the journal for the purpose.

We are constantly reminded of the need for an American-English dictionary, or rather, a comparative manual of grammatical usage. Possibly M. Bergson could best deal with the yawn-inspiring intricacies of American "humor" as exemplified in Mr. Elbert Hubbard's remarks about "the late J. Cæsar." Speaking individually, we are also more than a little bored with the language of the "man who can take pictures in the mind." This is Mr. Herbert Kaufman, whose essay on The Dreamers was read by Mr. Henry L. Doherty, the Wall-Street banker, in the discussion on Mr. Roemer's paper. Many sales managers nowadays deem it necessary to write ungrammatical and childish boosting letters to their salesmen, based on the old "heart-to-heart talk," which, ten years ago, was only to be found in the cheapest and least responsible papers for girls, mostly read by servants. This is, we suppose, a sign of the times, and will be levelled out in the future.

As a book, this publication is nicely got up, well printed, and illustrated with portraits of the authors of the several addresses and of typical scenes in the life of the camp. There are eight split infinitives, and we have noticed "facotry" on p. 153, and on the plate facing p. 73, Hon. John C. Roemer instead of Hon. John H. Roemer. The book is in marbled paper boards, half buff basil, is well indexed, and provided with a bookmark. Its dimensions are 9in. by 6in., and it is entirely free from advertisements. We give these details to show that for five shillings anyone can buy this nice volume, just as for the same sum he can buy the paper-covered and often carelessly-printed Proceedings of the I.M.E.A.

In conclusion, we recommend the book to the careful perusal of all who have the ultimate welfare of our profession and industry truly at heart.

Insulation and Design of Electrical Windings. By A. P. M. Fleming and R. Johnson. London: Longmans, Green & Co. Price 7s. 6d. net.

It should be generally recognised that insulation, since it is the most vulnerable, is the most important part of electrical machinery. Both electrical manufacturers and buyers are faced with the problem of ensuring the maintenance of electrical service, while dependent on the use of materials which are inherently of a treacherous mechanical character.

The use of very large units, the interior of the windings of which must of necessity be at a high temperature, owing to their relatively small volume,

has made the insulation problem of paramount importance.

Until comparatively recently, the amount and quality of the insulation used in an electrical machine were fixed almost entirely by a method of trial and error, but at the present time a large number of careful, and more or less reliable, research results are available in various *Proceedings* and *Journals*.

The volume under review is one of the very small number of books dealing with this vital question in a connected and scientific fashion. It consists of seven chapters, the first of which deals with the physical characteristics of gaseous, liquid and solid dielectrics. A good and interesting résumé of the researches due to Sir J. J. Thomson (mis-spelt Thompson on pages 1 and 6) and others, is given. It should have been pointed out on page 13, when discussing the loss due to corona on transmission lines, that this loss with a given voltage decreases both with increase in diameter of the conductor and with increase in the spacing. A number of curves are given which illustrate very clearly the complex character of the phenomena which have to be investigated in connection with dielectrics generally.

Chapter 2 discusses electrostatic conditions in practical working. It is noteworthy that the apparently academic "electrostatics" of the electricity and magnetism textbooks should have become of industrial importance. The reviewer is glad to see that the authors have not introduced the prehistoric conception of an electrostatic charge on a conductor. The unfortunately common use of this idea destroys the analogy between the two components of the electric field, and makes the discussion of dielectric stresses unnecessarily complicated. A clear account of the voltage distribution for several types of winding is given.

One of the most useful chapters in the book is chapter 3, which deals with the enormous subject of insulating materials. The quantity of scattered information at the disposal of the authors is, of course, prodigious, and it may at once be stated that they have made a careful, and as far as the reviewer has been able to check, an accurate, selection. We are glad to see it clearly pointed out that the majority of insulating materials are of an organic origin, and are therefore naturally subject to continual change, tending ultimately to disintegration. Papers, tapes, varnishes, methods of applying varnishes, fibres, mica and mica products (the latter being included in the excellent articles published in ELEC. REV. Nos. 1817 and 1818), oils, etc., all receive a due meed of attention. Some very useful and, so far as the reviewer is aware original information is given at the conclusion of this chapter regarding the mechanical strength of insulators and conductors. The statement in Professor Walker's paper on turbo coils, that some forms of insulation appeared to have considerable strength or stiffness, is supported by the results recorded here.

Chapter 4 is devoted to the design of insulation and windings. The chapter opens with some common-sense remarks on the principles governing the rating of machines, followed by the German standard specification for the testing of electrical machinery. The reviewer is quite of the authors' opinion as to the marked difference in temperature rise allowed by the German Normalieh for cotton and papers, not being justified. Owing to the discrepancies of at least 10 per cent. in temperature measurements, and to the fact that electrical machines may have to work in temperatures of 40°C., it is desirable that the allowable temperature rise for fibrous materials of all kinds should not exceed 50°C., since these materials cannot be safely exposed to greater temperatures than 100°C. Furthermore, since the insulation is not itself the seat of the generation or loss of heat, it is the temperature of the adjacent copper or iron which has to be considered, and as this temperature depends on the heat flow, no method of measurement is really accurate unless these conditions are known, and they can never be accurately known in a commercial machine.

The principal types of machine and transformer windings and their insulation on scientific principles are next discussed in a satisfactory manner.

Chapter 5 deals with insulation tests. We are glad to see the fallacy of paying great attention to insulation resistance tests pointed out. It is rather extraordinary that even in these days there should still be so much misconception regarding this matter. Insulation resistance measurements have their use, but are no criterion whatever of the quality of the materials used, as prolonged drying raises the reading to an almost unlimited extent provided that the surfaces are clean.

A précis is given of the German and American regulations regarding insulation tests, together with the usual methods of testing armatures for open circuits, etc. Some useful information regarding testing transformers for apparatus of large electrostatic capacity is also included.

Following we have a number of practical observations regarding the drying and handling of electrical windings, which though somewhat brief are quite sound.

The concluding chapter consists of five pages dealing with the principal types of insulation failures. A good index is appended.

As a whole the book is by far the best value for the money that the reviewer has seen on this most important and difficult subject.—H.G.S.

ELECTRICAL TERMS AND DEFINITIONS.

(*Concluded from Vol. 74, page 1040.*)

RUHMKORFF COIL.—A kind of transformer used for producing high electromotive forces, consisting of a primary and a secondary winding on a straight core. The primary is supplied with a continuous current which is periodically interrupted.

RUNNING LIGHT (of a generator, converter, or transformer). —Running when no appreciable current is delivered to the external circuit. (Of a motor).—Running when no power is delivered at the shaft.

SAFETY, FACTOR OF.—*See* Factor.

SAG of a wire.—The maximum vertical distance between a wire and the straight line joining the points from which it is suspended.

SECONDARY of a transformer.—*See* Secondary Winding.

SECONDARY BATTERY.—*See* Accumulator.

SECONDARY WINDING of a transformer.—The winding in which the electromotive force is generated by electromagnetic induction and from which electrical energy is supplied to the external circuit.

SECTION INSULATOR.—An insulator by means of which a conductor is divided electrically into sections while maintaining mechanical continuity.

SECTION SWITCH.—A switch for electrical disconnection of a circuit into sections.

SELECTOR SWITCH.—A switch for connecting a circuit to any one of a number of other circuits.

SELF-INDUCTION, COEFFICIENT OF.—*See* Induction, Self-.

SENSIBILITY or SENSITIVITY.—*See* Figure of Merit.

SERIES.—Two or more conductors are said to be in series when they are so connected that they are traversed by the same current.

SERIES DYNAMO.—A dynamo in which the field magnet coils are in series with the armature.

SERIES PARALLEL.—(*a*) A number of pieces of apparatus are connected in parallel and the groups so formed are connected in series.

(*b*) A number of pieces of apparatus are connected in series, and the groups so formed are connected in parallel. In U.S. it is common to call (*b*) Parallel Series in order to distinguish it from (*a*).

SERIES-PARALLEL CONNECTION.—Pieces of apparatus are connected either in series or parallel with arrangements for changing over from one set of connections to the other.

SERIES-PARALLEL CONTROLLER.—A device for making Series-Parallel Connection.

SHORT.—A colloquial abbreviation for a Short-circuit or for the act of making a Short-circuit.

SHORT-CIRCUIT.—A connection, whether accidental or intentional, between two points in a circuit, by means of a path having a low resistance.

Short-circuited Rotor.—A rotor which is short-circuited in itself. *See* Squirrel-cage.

Shoe.—An appliance for effecting a sliding connection between a conductor rail of an electric railway and the electrical equipment of a car.

Shunt.—(*a*) Circuits are said to be in shunt or in parallel one to the other when a current is divided between them.

(*b*) A by-path for an electric current.

(*c*) Shunt circuit is a term applied to the pressure circuit of measuring instruments such as electricity energy meters, wattmeters, etc.

(*d*) A current shunt is a term applied to a low resistance used for the measurement of currents by means of a potentiometer; or by an ammeter through which only a fraction of the current passes.

Shunt Coil or Winding.—A coil or winding which is connected in shunt or parallel to some part of the circuit.

In a generator or motor.—The field magnet coils of a shunt dynamo or motor, these coils being excited by a current practically proportional to the pressure.

Shunt Dynamo.—A dynamo in which the field magnet coils are connected to the terminals in shunt.

Shunt Instrument.—An instrument in which all but a fraction of the current to be measured is passed through a resistance connected in parallel with the measuring instrument.

Shunt Motor.—A motor in which the field magnet coils are connected to the terminals in shunt.

Shuttle or Siemens Armature.—An early form of armature for a generator or motor, resembling a shuttle, and having a single coil and two core faces. Sometimes called an H armature.

Siemens Dynamometer.—An instrument for measuring currents, either continuous or alternating, consisting of a fixed coil and a suspended coil controlled by a spring, the torsion of the spring being proportional to the square of the current when the coils are brought back to their initial relative positions.

Siemens Unit of Resistance.—The resistance of a column of mercury of a sectional area of one square millimetre and of a length of one metre, at 0°C.

Silver Voltameter.—An apparatus for measuring a quantity of electricity by the weight of silver deposited on a platinum kathode from a solution of silver nitrate.

Simplex.—A method of telegraphic working in which only a single message is transmitted at one time.

Single-phase.—*See* Phase.

Single-Pole Switch.—A switch which opens a circuit at one point only.

Siphon Recorder.—An apparatus used in submarine telegraphy consisting of a magnetic field in which a moving coil makes a record of the signals by means of a siphon acting as a pen.

Skate.—An appliance for effecting a sliding electrical connection between the studs of a surface contact system and the electrical equipment of a car.

Slide Wire.—In a measuring instrument a wire of uniform resistance on which a sliding contact makes connection at any desired point.

Slip.—In an induction motor the angular velocity of the rotor is less than that of the rotating magnetic field of the stator, and this difference expressed as a fraction of percentage of the angular velocity of the rotating magnetic field is called the slip. The use of the word Slip to express the mere difference of angular velocities is not recommended.

Slipper Brake.—A brake in which a block or slipper is pressed against the rails of a tramway. Also called a Track Brake.

Slip-ring.—A conducting ring for effecting, by means of a brush, a sliding connexion between a revolving conductor and a fixed conductor. *See* Collector ring.

Slot System.—*See* Conduit System for traction.

Slotted Core.—An armature core of a generator or motor having slots in the iron in which conductors are placed.

Smooth Core.—An armature core of a generator or motor on the surface of which conductors are laid.

Socket, Lamp-.—Synonym for Lampholder.

Solenoid.—A coil of tubular form for producing a magnetic field.

Sole Plate (tramway).—A plate or piece of rail fastened below a rail joint for strengthening and anchoring it.

Sounder.—A telegraphic receiving instrument producing audible signals.

Spacing Current.—In telegraphy a current used to produce the space between the signals, flowing generally in the reverse direction to the signalling currents.

Span Wire Construction.—A mode of supporting a trolley wire by transverse span wires stretched between poles or buildings.

Spark (electrical).—A disruptive discharge of electricity through a dielectric.

Spark-gap.—Any break in the continuity of a conductor so arranged as to permit of a disruptive discharge across the break.

Specific.—Pertaining to or characteristic of a substance; *e.g.* the specific resistance of a given material is the resistance between the opposite faces of a cube of that material whose edge is one centimetre.

Squirrel-cage.—A winding used on induction motors which consists of a number of bars, the ends of which are short-circuited.

Standard (noun).—A thing serving as a basis of comparison. Such as a weight or measure to which others conform or by which the accuracy of other weights or measures is judged. *See* also Unit.

Standard Candle.—Formerly used in photometry. A sperm candle weighing one-sixth of a pound, intended to burn 120 grains per hour.

Standard Candle (International).—Unit of light. One-tenth of the light given horizontally by the Standard Ten-candle Pentane lamp under specified conditions.

In U.S. the Standard is maintained through the medium of a group of selected incandescent lamps at the Bureau of Standards in Washington.

Standards, Electrical.—British Board of Trade. *See* also Units, International. Resistance, the one-ohm coil of wire. Current, the one-ampere balance. Potential difference, the 100-volt electrometer.

Standard Lamp (electrical fitting).—A lamp to stand on a table or floor. Lamp-standard, a pillar supporting a street lamp.

Star.—A mode of connection in polyphase alternating-current working, in which three or more conductors meet at a common junction called the neutral point. When there are only three conductors, also called a Y connection.

Static.—(1) Pertaining to electricity at rest. Abbreviation for Electrostatic. (2) Sometimes applied to a transformer, to distinguish it from a converter. Not recommended.

Stator.—In an alternating-current generator or motor, the winding and associated iron, whether acting as armature or as field magnet, which does not rotate.

Storage Battery.—*See* Accumulator.

Striæ.—In an electric discharge through a gas, alternate dark and luminous transverse bands.

Stud (tramway).—A piece of metal or apparatus from which the current is collected, laid down in the street between the rails of a surface-contact system of traction.

Sub-station.—Officially defined in Great Britain as premises in which electrical energy is transformed or converted for the purpose of supply to consumers, if such premises are large enough to admit the entrance of a person after the transforming or converting apparatus is in position. (Thus distinguishing it from a Transformer Box or Chamber).

Sulphate, of an accumulator.—In a lead accumulator the formation on the plates of a sulphate of lead which is inactive and hinders the action of the cell.

Surface Contact System.—A tramway system in which studs normally dead, placed between the rails, become connected to a main only when a car passes over them.

Surge.—An abnormal rush of electricity along a conductor.

Surge-impedance.—The natural impedance of any long conductor to transmit electric currents or surges, $= \sqrt{l/c}$.

Susceptibility.—*See* Magnetic Susceptibility.

Suspension Wire (Telegraph).—Synonym for Messenger Wire.

Switchboard.—An assemblage of switches, fuses, conductors, measuring instruments, and other apparatus for the control of electrical machinery and circuits.

Switch Hook (Telephone).—The hook on which a receiver is hung. When the receiver is placed on the hook its weight performs certain switching operations.

Synchronism.—Two machines are said to be in synchronism when they are running on one system with identical frequency and a definite phase relation.

Synchronize, To.—To cause two or more machines or pieces of apparatus to have the same periodic time or frequency and a definite phase relation.

Synchronous Motor.—An alternating-current motor which normally runs at the speed corresponding to synchronism with the supply.

Synchronoscope.—An apparatus intended to indicate when two alternating potential differences are in synchronism and in phase.

Syntonize.—To adjust to the same periodic time or frequency. In wireless telegraphy called to Tune.

Syphon Recorder.—*See* Siphon Recorder.

Tandem.—*See* Cascade.

Tapper (Wireless).—An apparatus which taps a coherer and automatically decoheres it after the receipt of a signal.

Telegraph.—An apparatus for transmitting messages to a distance by means of signals.

Telegraph Line.—*See* Line.

Telephone.—An apparatus for transmitting sound to a distance.

Telpherage.—A system for the electrical transport of goods or materials in self-contained motor-driven receptacles suspended from, and running on, stretched wires.

Temperature Coefficient.—The change in the magnitude of any property of a substance caused by a rise of one degree Centigrade in the temperature, expressed as a fraction of the magnitude at some definite temperature adopted as a standard.

Temperature Rise.—Of electrical machinery. The increase of temperature of any part of an electrical machine above the temperature of the surrounding atmosphere.

Tension.—A synonym for Electromotive Force or Difference of Potential. Obsolete term when used alone.

Tension, High.—Synonym sometimes used for High Voltage, or High Pressure. Abbreviation H.T. (Board of Trade limits, 650 to 3,000 volts, whether continuous or alternating).

Tension, Extra High.—Synonym sometimes used for Extra High Voltage or Pressure. Abbreviation E.H.T. (Board of Trade limit, above 3,000 volts, whether continuous or alternating.

Terminal.—That part of an apparatus or circuit to which conductors are intended to be joined in order to connect it electrically to another apparatus or circuit.

Terminal Voltage.—*See* Difference of Potential at the Terminals.

Thermo-couple.—A pair of conductors joined to produce a Thermo-electric Effect.

Thermo-electric Effect.—The electrical effect due to a difference of temperature between two junctions. Sometimes called Seebeck Effect.

Thermo-pile.—Apparatus consisting of thermo-couples suitably arranged.

Third Rail.—*See* Conductor Rail.

Thomson Effect.—(*a*) The electrical effect due to a difference of temperature between two parts of one and the same conductor; (*b*) the liberation (or absorption) of heat which takes place when current flows from a hotter to a colder portion of the same metal.

Three-phase.—*See* Phase.

Three-phase Transformer.—A transformer in which three magnetic circuits have parts in common with one another.

Three-wire System.—A system of supply through three wires, in which the potential of the middle wire is intermediate between those of the outer conductors.

Time-constant.—When the rate at which a function is diminishing equals the function multiplied by a constant quantity, the reciprocal of this quantity is called the time-constant. It is equal to the time taken by the function to fall to $\frac{1}{e}$, that is, 36.8 per cent. of its initial value.

Total Loss.—The difference between input and output.

Transformer.—An apparatus without moving parts which by means of electromagnetic induction transforms alternating voltages into alternating voltages of the same frequency, but generally of different magnitude.

Transformer Box or Chamber.—A box or chamber containing a transformer and not large enough to admit the entrance of a person after the transformer is in position. (Thus distinguishing it from a Sub-station).

Transformer, Core Type.—A transformer with a closed magnetic circuit in which the copper windings completely or almost completely enclose the iron core.

Transformer, Primary of.—*See* Primary.

Transformer, Secondary of.—*See* Secondary.

Transformer, Shell Type.—A transformer with a closed magnetic circuit in which the magnetic circuit completely or almost completely encloses the copper windings.

Translator.—A form of telegraphic relay. Also called a Repeater.

Transmitter.—That part of a telegraphic or telephonic apparatus by which signals are sent.

Trolley System.—A traction system employing cars on each of which is mounted a standard carrying a boom. At the end of the boom is fixed a swivelling trolley head containing a trolley wheel which runs on the trolley wire. When the car is single-decked or has a roof over the upper deck the boom is carried on a base.

Trunk Main (*a*) in electrical supply.—A main used as a feeder between a generating station and a sub-station or between two generating stations. (*b*) in telegraphy and telephony.—A line consisting of numerous circuits connecting two or more towns or exchange areas.

Tube of Force (Electrostatic Faraday Tube).—The unit tube of force is bounded laterally by lines of force which enclose unit charges at its ends. It therefore contains 4π lines of flux.

Tune, To (wireless telegraphy).—To adjust to a given periodic time of frequency.

Turns, Ampere-.—*See* Ampere-turn.

Two-Phase System.—*See* Phase.

Two-phase Transformer.—A transformer for two-phase currents, in which two magnetic circuits have parts in common with one another.

Unifilar Suspension.—The suspension of the moving part of an instrument by a single thread or wire or strip, the restoring force being produced by its torsion.

Unipolar.—*See* Homopolar.

Unit (physical).—A selected definite physical quantity in terms of which the magnitudes of other physical quantities of a like kind may be reckoned or expressed.

C.G.S. system of units. A system employing the centimetre, the gramme, and the second as the fundamental units.

Electromagnetic primary Units. 1. Unit of Resistance. 2. Unit of Current. 3. Unit of Difference of Potential.

Derived Units. Quantity, Capacity, Self-induction.

Practical Units. *See* Practical Units.

International Units. The Ohm, Ampere, Volt, and Watt.

Board of Trade Unit. One Kilowatt-hour or Kelvin.

Virtual Ampere.—The alternating current which produces the same heating effect as one ampere continuous current. The root-mean-square of the current, sometimes called Effective Ampere. A term not recommended.

Virtual Volt.—The alternating electrical pressure which when applied to a non-inductive resistance of one ohm produces one virtual ampere. The root-mean-square of the volts. Sometimes called an Effective Volt. A term not recommended.

Volt.—(*a*) The electrical pressure which when applied steadily to a conductor the resistance of which is one ohm, produces a current of one ampere.

(*b*) 10^8 C.G.S. electromagnetic units of Electromotive Force.

Voltage.—Synonym for Electromotive Force, Difference of Potential and Pressure. Generally used descriptively.

Voltaic Current.—An electric current produced by chemical action.

Voltameter.—An electrolytic cell arranged for the purpose of measuring an electric current by determining the amount of chemical action produced.

Voltmeter.—A measuring instrument with its scale graduated in volts for measuring electromotive force.

Wall Plug.—An appliance containing both of the terminals of a twin flexible conductor, generally in the form of two pins (two-pin plug) or a pin and a concentric ring (concentric plug) which, when it is inserted in a wall socket, makes connection between the flexible conductors and the fixed leads.

Wall Socket or Shoe.—An appliance fixed to the wall into which are brought both the leads or conductors connected to a source of supply so that connection may be made by inserting a wall plug.

Watt.—Unit of Power. The energy expended per second by an unvarying current of one ampere under an electric pressure of one volt. With alternating current, the product of the instantaneous amperes into the instantaneous volts gives the instantaneous value of the power. The mean value of this over a whole period is the power in watts. It is equal to 10^7 ergs per second or 1 joule per second. *See* Kilowatt.

Watt-hour.—The total energy expended when electrical energy is expended at the rate of one watt for one hour, or its equivalent, such as 4 watts for 15 minutes. Equal to 3,600 joules.

Watt-hour Meter.—An integrating meter for measuring watt-hours. Also called an Energy Meter. The use of the term wattmeter in this connection is strongly discouraged.

Wattless.—When the phase difference between the current and the applied voltage is 90 degrees, the current is said to be Wattless or Reactive. In U.S. a term used by some, but strongly disapproved of by many.

Wattmeter.—An instrument with a scale graduated in watts for measuring electrical power.

Weston Cell.—A mercury, cadmium-sulphate, cadmium amalgam cell, prepared according to a certain specification, used as a standard of potential difference.

Wheatstone Bridge.—A particular arrangement of resistance, galvanometer, and battery as an instrument for the comparison of resistances.

Wheel Base (railway or tramway).—The distance between the points of contact of successive wheels of a vehicle with the rails.

Windage.—The friction of the air on moving parts of machinery and vehicles.

Winding.—All the conductors, turns, or coils belonging to one system.

Yoke.—The iron connecting piece between the ends of the core or cores of an electromagnet, which is outside the windings.

ELECTRIC MAINS EXPLOSIONS.

The report of the Board of Trade Committee, appointed in December, 1913, to consider the causes of explosion in connection with the use of bitumen in laying cables at Nottingham, Hebburn, and elsewhere, has been issued.

The committee examined fourteen well known engineers and points out that during the past 11 years some six or seven serious explosions have taken place in houses due to the ignition of vapour generated by short-circuits between electric cables laid underground in the streets. Explosions have occurred from similar causes in manholes or street boxes; there have been many cases of minor explosions which have merely raised the lids of manholes or have disturbed the pavement, and there have been also explosions in electric street boxes due to the accumulation of coal gas from leaks in defective gas mains.

In investigating the causes of these explosions the committee found that no serious cases have been recorded, nor could witnesses adduce instances, where the supply was given by alternating current, by concentric mains, or by lead-covered paper-insulated cables, and evidence showed that three-core cables may be added to this exclusory list.

Vulcanised bitumen has been the material used for insulating the cables in all the cases of serious explosions in houses, and these have been drawn into bitumen casing or have been laid in bitumen on the "solid system."

While mains have been laid in many thousands of miles of streets with separate cables on the solid system and the serious accidents which have occurred through explosions have not been numerous, it appears that gradual deterioration sometimes takes place owing to original defects in the method

of laying, or to injury inflicted on the cables in the course of other work in the street, such as alterations of gas mains, &c.

The Committee found that serious explosions, with, perhaps, one exception, have not occurred in small towns.

The use of pitch-compound instead of bitumen has developed to a sufficient extent to justify the view that serious explosions do not occur when such material is used for filling on the solid system.

Deterioration of vulcanised bitumen cables arises from three causes: (A) Coal-gas coming into contact with bitumen softens it, and the insulation suffers, but no case of explosion has been traced to this cause. (B) In the case of positives a fault, probably rarely due to an original defect, but generally to some injury inflicted during or after laying, is attended by corrosion, the production of green incrustation, and eventually by interruption of the copper conductor. The electric current which leaks to earth is so small that it cannot be distinguished by ordinary instruments from general leakage, the total insulation of such cables never being high. A solitary defect of this kind appears to result in nothing more than the inconvenience of the breach of continuity. (C) A fault to earth on a negative decomposes the insulating material and not the conductor. By the action of osmosis, moisture is attracted and the vulcanised bitumen becomes pulpy or sodden. The effect spreads, and sometimes many yards in length are affected. Electrical tests of inspection may reveal such faults, but if not detected, a leak between negative and positive, or, in the case of three-wire systems, between negative and middle, develops and results in a short-circuit. Where the resistance of the cables is sufficient to control the current, the heat may only melt the surrounding bitumen, which flows in, quenches the arc, and seals the fault.

If, on the other hand, the arc persists, the vulcanised bitumen and the bitumen in which the cables are laid is melted. Both vapour and gas are given off. At the high temperature which is present the vapour is "cracked" or dissociated into gas in considerable volume, and if in a confined space, under considerable pressure. When these products can force their way and escape through the surface of the roadway or between the joints of paving stones there is a chance that the arc may burn itself out, either by flooding of bitumen or by failure of current consequent on the lengthening of the arc owing to melting and volatilisation of the copper. If owing to an impervious pavement the gas is forced, or if having free access it passes into a house and becomes ignited, an explosion may be the result.

Bitumen casing is now no longer manufactured, but considerable quantities remain in use in districts where no accident due to bitumen gas has occurred.

This narrows the matter to the consideration of the filling material used on the solid system, and the troughs into which it is poured.

It must be admitted that bitumen and pitch-compound are the only practical materials that can be used to fill the troughs.

The advantages of bitumen are that, since it undergoes a process of preparation, it can be supplied of a quality which is claimed to liquefy at a practicable temperature, to run freely, to weld itself to a subjacent layer, to adhere firmly to cables and to the right kind of bridges, to retain at temperatures above freezing point such viscosity that in case of subsidence of the ground it will bend slowly without fracture, or if cracked, will re-unite. So long as it is continuous it protects the cable from moisture. The temperature recommended for pouring is between 250° and 350° Fahr. If it is heated above 400° Fahr. hydro-carbons are driven off and it becomes brittle, but some engineers have found it difficult to make a good job unless the bitumen was run at about 420°. Mains to the value of between two and a half and three millions sterling are said to have been laid in this way.

The alternative to bitumen is pitch. Blast-furnace pitch contains substances which make it unsuitable. Coal-tar pitch by itself is too brittle, though it has been used successfully for 40 years for protecting lead pipes. Experiments in tempering it with oil and afterwards strengthening it with whinstone dust were encouraging, and resulted in one case in a mixture of three tons of pitch to two of stone dust and 10 gallons of pitch or creosote oil. In another case 10 cwts. of pitch, 10 cwts. of limestone dust, and 10 gallons of tar oil were used; this pitch-compound was tested in a cement-testing machine and was found to be as tough as bitumen. The chief advantage claimed for this over bitumen is cheapness. The melting point is lower; it can be run at 260° Fahr. This lower temperature and the fact that the specific heat of pitch is about 0.5 as against 0.8 for bitumen have the advantage that cables over which it is poured are not so likely to be overheated. On a damp day hot bitumen froths up, and unless considerable care is taken the copper core expands and the cables writhe and buckle. Pitch-compound holds firmly to unglazed stoneware bridges; it is apparently not affected by creosote or by coal-gas.

It appears that a condition precedent for a serious explosion is to be found where two or three separate vulcanised bitumen cables are laid solid in bitumen in one trough. The experience of breakdowns has led to certain improvements in carrying out the solid system, and where conditions are such that lead-covered paper-insulated cables or armoured cables laid direct in the ground cannot be recommended, the solid system carefully laid with due precautions has its advantages, but it ceases to be a cheap method. Earthenware troughs with separate chases or a separate trough for each cable is the best method, but it is expensive and occupies a good deal of space.

The Hebburn accident was due to three preventable causes. At a corner where the direction changed 40 degrees, wooden troughs were merely mitred together. (*a*) Not only had the two cables been pulled up against the wood, but the outer one had been pulled until it rode over the other, and so remained for 11 years, when a fault developed. (*b*) An impervious continuous cement pavement was laid over the cables. (*c*) The cables were laid close to the foundations of a house, and these consisted of loose rubble with no lime or cement.

In most cases where explosions have occurred an impervious pavement of concrete or asphalt had been laid over the mains. It is found that with a flagged pavement the gas can escape between the joints. The nature of the pavement should be taken into account in considering the use of a solid system employing bitumen.

In three cases of explosions services have been so laid that access was given to the interior of houses, and gas freely entered. Most witnesses agree that services should be solidly bricked in, armoured cable being generally preferred. There was general agreement that services should not be carried in on the solid system. On the other hand the committee learned that over 10,000 services on the solid system had been laid in a Midland city, and that there had not been a single fault.

The testing of the insulation of a distributing network of mains has a bearing on breakdowns and on accidents arising therefrom. Separate vulcanised bitumen cables claim to be sufficiently well insulated to offer satisfactory continuity of service, but do not compete with other classes of cables in measurable insulation. In order to comply with the Board of Trade Regulation 34, in some cases the middle wire feeders are bunched on to one bus-bar and the total current is recorded on one instrument, but by the use of a number of recorders on different circuits the localisation of faults is facilitated, and an erratic record suggests that a fault is on a consumer's premises, while a steadily increasing current indicates that it is on the network.

The current which may be neglected as the sum of inevitable leakages depends on the size of the undertaking. The one-thousandth permitted by Regulation 34 could not be tolerated on a large network, for with an output of 8,500 amperes, 8½ amperes would be considered a very serious fault, and if not removed would result probably in a short-circuit or breakdown. As soon as three or four amperes is recorded tests would be immediately undertaken to find the fault. In many large and small towns the current to earth from the middle wire is regarded as a practical indication of a fault. In small towns if one-fifth of an ampere leakage is found the engineers proceed to look for it.

The fraction one-thousandth clearly cannot apply to networks of all sizes, but no suggestion has been made for a test which can be of general application. If the principle of districting is carried out, a large network can be cut up either normally or by the action of fuses into small ones.

Automatic records are supplemented by other tests, *e.g.*, in one city, the use of a bank of lamps between middle wire and earth. A switch cuts these in or short-circuits them, and the positive and negative ammeters are observed and from their indications leakages to earth may be estimated. Another test is to take a reading of the amperes to earth on the middle wire connection and then to put the positive main to earth through a resistance, and read the altered current to earth. If the normal reading indicates a fault to earth of the negative and the second reading is zero, it shows that the artificial leak put on the positive is equal to the leak on the negative. Another method is to send out men with a bank of lamps taking, say, 10 amperes, and to connect these between positive and earth and between negative and earth at various points on the network at prearranged times. The switchboard attendant notes the current indicated at those times by the ammeter. If the whole 10 amperes is accounted for on the switchboard it is evident that the insulation of the network is good.

In another class of tests the middle wire is disconnected from earth.

Another method is one of observing leakages rather than testing insulation. This is to disconnect the middle wire from earth, and to earth the positive and the negative alternately through an adjustable resistance. This gives the combined leakage current of the neutral and the opposite polarity main.

In certain small towns where there have been no explosions of any importance, the leaks are so small that they would not be recorded on ordinary commercial instruments, and the practice is to disconnect the middle wire, and to put the outers alternately to earth through a lamp.

Where 20 amperes is considered a normal leakage, a bad fault will pass twice that current or more, and there is a difference of opinion whether such currents may injure the cables by developing incipient faults. Some few engineers hold that it is desirable thus to break down incipient faults and put the outers direct to earth without any controlling resistance.

It is difficult to draw a distinction between this "test" and the practice known as burning out a fault. The witnesses by a large majority deprecated this practice.

It is possible by disconnection of cables or of links in junction boxes to cut off part of a network for repair. Such disconnection is sometimes made for the purpose of localising a fault. This practice, desirable in the case of large networks, is not feasible in small towns.

In one large city the engineer prefers to keep no less than 206 districts electrically separate, connected neither by fuses nor links. This practice has continued for 16 years and there have been no explosions.

Many large undertakings have networks interconnected by fuses which normally carry moderate balancing currents, but two difficulties prevent a wider use of this system. The fuses should be placed at points where there is no current, but the distribution of load in winter may differ so much from that in summer, that the fuses need constant attention. The other difficulty is that certain kinds of fuse go off explosively on heavy short-circuits, as when tested on a large battery.

On the other hand, some few engineers prefer the more simple plan of one solid network of single cables with no fuses, and rely on the burning out of a fault when it occurs. Such networks are divided only for the purpose of localising faults, and the insulation in such cases is generally so low that incipient leaks cannot be detected in time to prevent breakdowns.

The committee concludes that in view of the small number of serious accidents which have occurred, compared with the large extent to which vulcanised bitumen cables laid solid in bitumen have been used, it is unable to recommend the Board of Trade to discontinue to approve of this system.

In view of conflicting opinions of witnesses, the committee cannot recommend that iron or stoneware troughing should be used to the exclusion of wood, but it recommends that wood troughing should be used only where it can be ascertained that the soil is suitable; that where separate mains are laid in troughing each cable should be laid in a separate trough, and that between the troughs there should be a space of not less than 2 inches tightly packed with earth or sand.

The committee recommends (1) that separate mains for continuous current supply should not be laid on the solid system below impervious pavements or close to the walls of houses; (2) that easy bends should be laid at corners, and the bitumen or pitch-compound should be poured after the straight lengths have cooled; (3) that where sharp corners of troughing are suspected to exist the mains should be opened up and the corners eased; (4) services should be taken into houses (preferably by the use of armoured cables) in such a manner that gas cannot enter.

In an appendix Dr. WHEELER, of the Home Office Experimental Station, Eskmeals, reports in regard to bitumen explosions, that no evidence could be obtained of any liability to spontaneous combustion on the part of the finely divided carbon that arises from decomposition at high temperatures of the hydrocarbon gases evolved from bitumen and pitch.

The limits of inflammability of the gases evolved on heating bitumen and pitch depend upon their composition, which varies with the temperature at which they are evolved. The gases evolved at 1,000° C. without cracking, have the following limits of inflammability:—

	Lower limit.	Upper limit.
Gas from bitumen	5.4 ...	20.5 per cent.
Gas from pitch and whinstone dust composition ...	10.7 ...	47.5 ,,

Thus, any mixture of air and the particular sample of bitumen gas tested that contains between 5.4 and 20.5 per cent. of bitumen gas is capable of self-propagation of flame; whilst in the case of the gas evolved at 1,000° C. from the pitch and whinstone dust composition, the limits lie wider apart—any mixture of air and the gas containing between 10.7 and 47.5 per cent. of gas is capable of self-propagation of flame.

When the gases are "cracked" by passing them over a highly heated surface, the percentage of hydrogen in them increases at the expense of the hydrocarbons. This tends to widen the limits of inflammability.

On the whole it would appear that pitch would be, if anything, a more dangerous material that bitumen from the point of view of possibility of explosion from the gases derived from it.

The pitch and whinstone dust composition can also be regarded as more dangerous than bitumen, not only on account of its wider limits of inflammability but on account of the high percentage of poisonous carbon monoxide that it contains.

If "cracking" of the gases is presumed to take place, the difference in composition between bitumen gas and pitch gas largely disappears, so that the limits of inflammability of the two kinds of gas become similar, but the gas from the pitch and whinstone dust still contains a high percentage of carbon monoxide.

Patent Restoration.—An order has been made for the restoration of patent No. 4,030 of 1908, for "Improvements in telegraph poles," granted to Frederick H. Tidnam.

THE MUNICIPAL ELECTRICAL CONVENTION.

(*Concluded from page* 37.)

Report of the Council.

THE report of the Council showed that the membership of the Association stood at 379, made up as follows:—

Committees (Members)	165
Chief Electrical Engineers (Members)	175
Honorary Members	6
Chief Assistants (Associate Members)	4
Assistants (Associates)	29

There was a net decrease of seven on last year's total, chiefly among the associates.

In connection with the standardization of metal filament electric lamps, the representatives of the Association on the Lamp Standards Committee of the Engineering Standards Committee urged the adoption of watt marking only; they found themselves in direct antagonism with representatives of the War Office, the Admiralty, the Post Office, and Public Works, all of whom were tied down to vote, under the direction of their respective departments, though they were personally in sympathy with the view of the I.M.E.A. A letter was subsequently sent to the Tungsten Lamp Association, informing them that the Standards Committee, by the majority of the votes from Government officials on that Committee, had decided to adopt the standard of marking both the candle-power and watts on lamps. The I.M.E.A. strongly objected to the same, and urged the Tungsten Association to adhere to the resolution already adopted by them in regard to watt marking only. The Tungsten Lamp Association in reply expressed their hearty approval of the marking of all lamps with watt rating only. The only exceptions made by members of the Association were where Government departments made specific requests for candle-power markings.

Thus matters had practically come to a deadlock so far as the I.M.E.A. and the Engineering Standards Committee were concerned, and it was not likely that a specification would be issued by the Standards Committee which would be acceptable to the members of the Association, unless the contemplated re-arrangement of the Standards Committee should result in considerable change in its constitution.

The Electric Vehicle Committee had recommended to the British Engineering Standards Committee that the 150-ampere concentric charging plug and receptacle, standardized by the Electric Vehicle Association of America, should be standardized for use in the United Kingdom for the charging of electric vehicle batteries, with the addition of means for earthing the chassis of the vehicle through the plug and receptacle and a third conductor in the flexible cable, with protection for the flexible cable similar to that known as "Cab-Tyre Sheathing." The Committee was considering the standardization also of a method of gripping this cable to the plug.

At the instigation of the committee, the B.E.A.M.A. had decided to recommend to the Engineering Standards Committee that lead traction battery plates should be standardized, viz., 8⅜in × 5¼in., with lug centres 4⅜in.

The committee hoped that important accessories connected with the electric battery vehicle might be made International Standards, and the International Electrotechnical Commission had agreed to undertake this work in co-operation with the committee.

Recommendations as to suitable charges to be made by electric supply undertakings for the supply of electric energy for charging the batteries of electric vehicles had been sent to every electric supply undertaking in the United Kingdom, and in very many cases the supply authorities had intimated their willingness to come into line with these recommendations.

The committee approached the various insurance companies and had made arrangements whereby the Car and General Insurance Company, of 1, Queen Victoria Street, intimated that they would give a 15 per cent. preference off their ordinary petrol insurance tariffs in favour of the electric battery vehicle, and probably later on increase the preference to 20 per cent. The committee believed that it would be only a matter of time before other offices came into line in this matter.

As the result of an application made by the committee, the Local Government Board stated that they were "prepared to entertain applications from local authorities for sanction to borrow money for the purchase of vehicles which they were authorised to provide in connection with the exercise of their statutory powers."

The Council had spared no efforts to press forward the Electric Lighting Bill, and desired to acknowledge the assistance rendered by Mr. Hugo Hirst and the late Mr. A. Bruce Anderson, chairman of the B.E.A.M.A. A circular letter was sent to all members of the association with regard to securing promises to ballot from the various members of Parliament, but no place was secured which could be of practical use.

The bill in its present form had the support of the British Electrical and Allied Manufacturers, and it was believed of all other interested parties except the Electrical Contractors' Association, which had declined to accept the proposed amend-

ments, and had also signified its refusal to have the matter submitted to arbitration.

The Council had had under consideration the standardization of conditions of contract. The I.M.E.A. representatives on the I.E.E. Model General Conditions Committee suggested that the I.E.E. should leave in abeyance their final proof pending agreement by other interested bodies. This suggestion was, however, not adopted, and the I.E.E. had issued their conditions without reference to either the I.M.E.A. or to the B.E.A.M.A. as being in agreement therewith.

The Institution of Electrical Engineers having disbanded the Industrial Committee, the Council had considered the desirability of the formation of an influential body representative of all sections and departments of the electrical industry, competent to deal with all matters of grave importance to the electrical industry. It was agreed that the proposal be approved in principle, and that preliminary arrangements be entered upon.

The hon. treasurer reported that there was a surplus for the year of £65 and a total surplus of assets over liabilities of £786, of which sum £600 was invested in L.C.C. stock. The association had borne the preliminary expenses in connection with the Electric Vehicle Committee, amounting to about £12, but some scheme will have to be devised whereby the committee would become self supporting. The balance sheet showed that the association was in a sound financial position.

The question of the salaries paid to central station engineers and their assistants had been carefully considered, but the Council was unable to take action.

A sub-committee, consisting of Messrs. Cramb, Wilkinson, Fedden, and Seabrook, had been appointed to deal with the standardisation of electrical accessories, including cooking appliances. The Engineering Standards Committee had invited the appointment of two I.M.E.A. representatives on their Electrical Plant Accessories Sub-Comtnittee, and Mr. Cramb and Mr. Seabrook had been so appointed.

The Council of the National Association of Local Government Officers held a meeting at Bristol on March 14th last, when the question of superannuation was discussed; it was more particularly in this connection that the association became affiliated to the N.A.L.G.O. It was reported that over 200 members of Parliament had been approached, and practically all supported the principle of superannuation. A letter was to be sent to the Chancellor of the Exchequer asking him to receive a deputation from the association, and the question would be raised as to the possibility of the chancellor obtaining a grant from the Government towards the cost of the scheme. The establishment of a Provident Section to commence with a deposit scheme for sickness benefit, and a scheme for death benefits, was also discussed, and the recommendation carried.

A draft form of "Conditions of Supply" had been drawn up by the I.M.E.A., to serve as a model only, being amended where necessary to suit local conditions.

ANNUAL GENERAL MEETING.

At this meeting some preliminary discussion took place on the new form of ballot sheet. It was resolved that the member of Council longest in office should retire earliest.

Objection was taken to the method of voting adopted, which follows I.E.E. procedure, but a subsequent resolution to amend this in future elections was lost.

The HON. SECRETARY (Mr. H. FARADAY PROCTOR) made a statement from which it appeared that the position as regarded the model general conditions of tender was a stationary one.

Some discussion took place as to the position of the I.M.E.A. Bill, which, we gathered, remains stationary. The HON. SECRETARY commented on the lack of interest taken in the matter by members of Parliament, and appealed to the association to help matters forward through this channel. He pointed out that they had the hearty support of everybody but the electrical contractors, and that if a number of corporations were to join in promoting a bill for similar powers it might facilitate the I.M.E.A. Bill passing at a later stage.

Subsequently the report and balance sheet were adopted, and the council and officers for the ensuing year elected as follows:—

President: *H. Richardson, Dundee. Sen. Vice-President: *A. C. Cramb, Croydon. Jun. Vice-President: : *F. M. Long, Norwich.

Past Presidents: J. Christie, Brighton; G. Wilkinson, Harrogate; R. A. Chattock, Birmingham.

Hon. Solicitor: *Ald. Pearson, Bristol.

Hon. Secretary: *H. Faraday Proctor, Bristol.

Hon. Treasurer: *J. E. Edgcombe, Kingston-on-Thames.

Members of Council—Engineers: A. H. Seabrook, Marylebone; S. J. Watson, Bury; F. Ayton, Ipswich; T. Roles, Bradford; S. E. Fedden, Sheffield; W. Wyld, Hampstead; *W. A. Vignoles, Grimsby; *J. W. Beauchamp, West Ham; *A. C. Blackman, Sunderland.

Committee Representatives: Coun. Gibson, Wolverhampton; Ald. Sinclair, Swansea; Ald. Smith, Barrow; Coun. Ellaway, Birmingham; *Coun. Crowther; Sheffield; *Coun. W. B. Smith, Glasgow.

It was agreed to leave the arrangements as to place of meeting next year in the hands of the Council, the members being assured in the meantime of a hearty welcome at Dundee. A resolution was passed expressing the sympathy of the members with Mrs. Bruce Anderson and with the council and members of the B.E.A.M.A. on the loss which they have recently sustained. Votes of thanks were also passed to those who had so generously entertained the visitors during the week.

Mr. A. H. SEABROOK (Marylebone), with the idea of obtaining the views of the association on the subject, wished to move a resolution expressive of the regret of the members at the dissolution of the Industrial Committee of the I.E.E. He subsequently withdrew the matter after hearing the views of the Hon. Solicitor (Ald. Pearson), that the committee representatives were not competent to vote on such a question.

Mr. W. A. VIGNOLES (Grimsby) moved a resolution that a special committee of the I.M.E.A., not necessarily consisting of members of council, and with power to co-opt suitable outside representatives, be formed to deal with any matters for furthering the supply and use of electricity from public supply mains. Other committees had failed because of the clashing of interests; he thought their interests were united.

Ald. SMITH (Barrow) thought it would be necessary to narrow down the subjects to be dealt with to one or two to obtain success, but Mr. F. AYTON (Ipswich) pointed out that sub-committees could deal with any special branch of business, as in the case of the Electric Vehicle Committee.

After Mr. J. E. EDGCOME had suggested the advisability of working on specialised lines, the resolution was carried.

A hearty vote of thanks was passed to the President (Mr. R. A. Chattock) and the proceedings terminated.

(*Elected.)

ENGINEERING STANDARDS COMMITTEE.

In consultation with the Institution of Electrical Engineers, the Electrical Section of the Engineering Standards Committee has lately been reorganised. The representation of the Institution of Electrical Engineers on the Main Committee of the Engineering Standards Committee has been increased to three, viz., Colonel R. E. Crompton, C.B., Sir John Snell, and Mr. Charles P. Sparks. By arrangement also with the Institution of Electrical Engineers the new Sectional Electrical Committee becomes the British National Committee of the International Electrotechnical Commission (I.E.C.).

A meeting of the Sectional Electrical Committee thus reconstituted, was held on June 12th last, when Mr., now Sir John Snell, the Chairman, was inducted by Sir John Wolfe Barry, K.C.B., the Chairman of the Engineering Standards Committee. A meeting of the same committee sitting as the British National Committee followed, with Mr. Alexander Siemens in the Chair.

The following is the list of the members of the reconstituted Sectional Committee as well as the list of the Sub-Committees and Panels:—

Sectional Electrical Committee, which is also the British National Committee of the International Electrotechnical Commission.

Sir John Snell (Chairman), representing the Crown Agents for the Colonies.

Alexander Siemens, Charles P. Sparks, Vice-Chairmen.

C. H. Wordingham, representing the Admiralty.

Capt. G. L. Hall, R.E., representing the War Office.

Maurice G. Simpson, representing the India Office.

G. Scott Ram, representing the Home Office.

W. Slingo, representing the General Post Office.

H. A. McFerran, representing the Office of Works.

Dr. R. T. Glazebrook, C.B., representing the National Physical Laboratory.

W. Duddell, F. Gill, R. Hammond, J. S. Highfield, Roger T. Smith, nominated by the Institution of Electrical Engineers.

A. C. Cramb, A. H. Seabrook, nominated by the Incorporated Municipal Electrical Association.

C. Koettgen, P. A. Lange, A. P. Wood, nominated by the British Electrical and Allied Manufacturers' Association.

W. R. Rawlings, nominated by the Electrical Contractors' Association (Incorporated).

E. T. Ruthven-Murray, nominated by the Incorporated Association of Electrical Power Companies.

(To be nominated), London County Council.

S. Sellon, Tramways & Light Railways Association.

Colonel R. E. Crompton, C.B., Sir John Gavey, C.B., Walter Judd, Dr. Gisbert Kapp, Prof. T. Mather, C. H. Merz, H. W. Miller, P. F. Rowell (Hon. Sec., British National Committee), Dr. A. Russell, Capt. H. R. Sankey, R.E. (Ret.), Dr. S. P. Thompson, and A. P. Trotter.

Mr. Alexander Siemens takes the Chair when questions affecting the I.E.C. are discussed.

List of Sub-Committees and Panels.

1. Sub-Committee on Standardisation Rules for Electrical Machinery. (1).—Dr. R. T. Glazebrook, C.B.
2. Sub-Committee on Physical Standards.—Dr. R. T. Glazebrook, C.B.
3. Sub-Committee on Electric Lamps.—Dr. R. T. Glazebrook, C.B.
4. Sub-Committee on Electric Power Cables.—Charles P. Sparks.
5. Sub-Committee on Electrical Accessories. (2).—C. H. Wordingham.
6. Sub-Committee on Telegraphs and Telephones.—Sir John Gavey, C.B.
7. Sub-Committee on Electric Traction. (To be constituted later).
8. Sub-Committee on Prime Movers for Electrical Plant.—Capt. H. R. Sankey, R.E. (Ret.).
9. Sub-Committee on Electrical Nomenclature.—A. P. Trotter.
10. Sub-Committee on Electrical Symbols.—Dr. A. Russell.

(1) Panel on Rating of Electrical Machinery presided over by Dr. R. T. Glazebrook, C.B.

(2) Panels presided over by Mr. C. H. Wordingham: (1) Meters; (2) Plugs; (3) Switches; (4) Fuses; (5) Heating and Cooking Apparatus; (6) Carbon Brushes, Control Gear and Electric Vehicle Accessories.

Taking over the international work has necessitated the appointment of three Sub-Committees on Prime Movers, on Nomenclature, and on Symbols, to which primarily international questions dealing with their respective subjects may be referred.

The British Committee, as on former occasions, has nominated its Delegates to attend the forthcoming meetings of the Special Committees of the I.E.C., as follows:—Nomenclature, Dr. S. P. Thompson; Prime Movers, Mr. Gerald Stoney; Rating, Dr. Gisbert Kapp; Symbols, Dr. A. Russell.

Mr. A. R. Everest (B.E.A.M.A.) has again been appointed as Counsel to the British Delegate on Rating.

The work at present in hand consists to a large extent in work of revision, though a considerable amount of new work is being undertaken upon which reports will be issued in due course. A preliminary draft of the British Standardisation Rules for Electrical Machinery is being drawn up by the Panel under Dr. R. T. Glazebrook, C.B., as an independent Chairman. In this work much valuable assistance has been rendered by the representatives of the B.E.A.M.A., and the I.M.E.A. The Panel is also co-operating with the Revision Committee of the American Standardisation Rules. The international aspect of the question, being closely bound up with the national, is being considered at the same time and with no little advantage.

The Specification for Electricity Meters is under revision and will be very considerably enlarged in its scope. The Panel, which is under the Chairmanship of Mr. C. H. Wordingham, has already held over sixteen meetings. Due to the cordial co-operation of all concerned, very considerable progress has been made and it is hoped that the revised Specification may be available at an early date.

A Specification for Two-and Three-Plate Ceiling Roses will be published almost immediately, as also a Report on the British Standard Method of Specifying the Resistance of Steel Conductor Rails. Progress is also being made in regard to the Standardisation of Two-pin Plug and Socket devices, a Specification for which should be ready in the Autumn. Through the assistance of the B.E.A.M.A. it is also hoped that considerable progress may be made in regard to the standardisation of a number of other accessories all of which are being dealt with by one or other of the five Panels presided over by Mr. Wordingham. In this connection it should be mentioned that the Committee is co-operating with the Electric Vehicle Committee of the I.M.E.A.

The Report on Cables is to be revised and extended, the work being undertaken by the Sub-Committee on Cables under the Chairmanship of Mr. Charles P. Sparks, who is taking the place of the late Mr. Robert Kaye Gray.

With the assistance and co-operation of the Electric Lamp Associations as well as of large users of lamps, Dr. Glazebrook's Sub-Committee on Electric Lamps will be in a position to continue its work upon a revised Specification to include both Carbon and Metal Filament Lamps.

The question of Tungsten Filament Electric Lamps for Automobiles is also being considered at the request of the Society of Motor Manufacturers and Traders by a Sub-Committee under the Chairmanship of Colonel H. C. L. Holden, C.B., R.A.

The reorganisation of the Electrical Section, uniting as it does all the important branches of the electrical industry, under the able Chairmanship of Sir John Snell, is sure to lead to results beneficial to the electrical industry not only as far as this country is concerned, but also in its broader international aspect.

Stocktaking Notice.—THE WALSALL ELECTRICAL CO., LTD., announce that their works will be closed from July 25th until August 4th for the purpose of stocktaking. A small staff will be in attendance to deal with urgent matters.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

G.E.C. Explosion-Proof Circuit-Breakers.

THE GENERAL ELECTRIC CO., LTD., of 67, Queen Victoria Street, London, E.C., have recently placed on the market a small breaker having a capacity of 30 amperes at 300 volts, or 15 amperes at 500 volts. It is of the double-pole type with overload trip, and the case is explosion-proof. The flanges are wide and well machined—in no case are they cut away to take the holding down bolts for the lid—and, in addition, a flame-proof gland is provided for the switch spindle to pass through the case into the interior. Internally the device has been designed with ample clearance, and with ample insulation. The G.E.C. standard patent interlock is embodied, so that the breaker cannot be closed until the lid is first closed, nor can the lid be opened until the breaker is in the "off" position. This interlock has been specially designed for colliery work, for which interlocking gear of a delicate nature is entirely unsuitable. The overload trip is easily adjustable over a wide range. The breaker has been designed to take the G.E.C. standard mining glands, which complete the flame-proof characteristics of the case.

Chromolyte Batteries.

MESSRS. J. J. EASTICK & SONS, of Clapton Common, N.E., are introducing a patent primary cell in which a number of novel features are embodied. Fig. 1 shows the battery, refills, and a portable lamp. The battery consists of a fixed electrode, a

FIG. 1.—CHROMOLYTE BATTERY, REFILLS, &C.

renewable zinc electrode, and a special electrolyte, contained in a hermetically sealed cell; the elements are put out of action by reversing the battery in the strap handle when not required for use. The electrolyte is made by dissolving "Chromolyte," put up in collapsible tubes, in water. The liquid cannot be spilt, and the process of recharging is easy and simple. It is stated that the cells do not polarise, and that they are lighter than storage cells and cheaper in working than dry cells. Other advantages claimed for them are high voltage, long life per charge, freedom from loss by leakage, and immunity from damage by short-circuiting. They are recommended by the makers for motor-car ignition and lighting, driving small fans, &c., and for all other purposes to which portable batteries are adapted.

Variable Precision Condensers.

THE STEELING TELEPHONE AND ELECTRIC CO., LTD., of Telephone House, 210, Tottenham Court Road, W., have brought out a moving-vane variable air condenser for wireless telegraphy, manufactured according to a process invented by Dr. Seibt, in which the difficulties met with in building up an air condenser with parallel plates are overcome. The plates are in the "Pre-

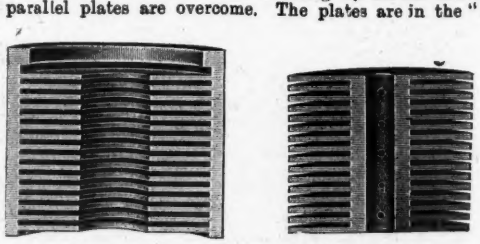


FIG. 2.—SECTIONS OF VARIABLE CONDENSER.

cision" type milled out of solid blocks of aluminium by specia machines (fig. 2); one section is stationary, while the other is attached to an insulated steel shaft projecting through the top of the protecting case, which is made of metal and can be filled with oil if it is desired to increase the capacity of the condenser. The

cover is faced with ebonite, on which the scale is engraved. A counterbalance (seen in fig. 3) attached to the rotary section enables the instrument to be used with its axis in a horizontal position if desired. Each condenser is tested up to 440 volts D.C.

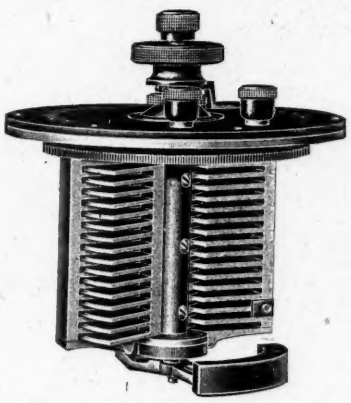


FIG. 3.—VARIABLE CONDENSER REMOVED FROM CASE.

Various patterns are made, including a specially small one for portable wireless installations, being $4\frac{3}{16}$ in. overall in diameter and $3\frac{3}{4}$ in. high, with a maximum capacity of 2,000 cm. Coupled condensers are also made.

Automatic Dimmer Switch.

THE ATLAS ELECTRICAL CO., LTD., of 58, High Street, Charing Cross Road, W.C., have drawn our attention to their patent Atlas automatic dimmer switch with remote control, which is illustrated herewith.

This is intended for use in cinematograph theatres and other places where it is frequently necessary to light or extinguish the lamps gradually, from several points in the building. By using

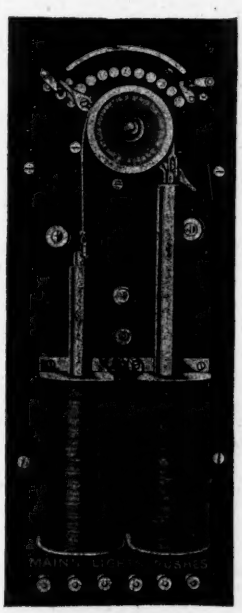


FIG. 4.—ATLAS AUTOMATIC DIMMER SWITCH.

remote control effected with pushes connected in parallel, the cost of wiring is reduced to a trifling amount, and the dimmer can be placed in the most suitable position. The dimmer here shown is actuated by two solenoids; when any push is pressed once, the switch is set in motion, and makes its own circuit, so that it is not necessary to keep the push pressed. After the operation is completed, if a push is pressed again, the action of the switch is reversed; but while the switch is actually in motion it is not affected by the pushes.

New 10-Ampere "Pivot Intermediate" Switch.

MESSRS. A. P. LUNDBERG & SONS, of 477-489, Liverpool Road, N., have recently introduced a new pattern "Pivot Intermediate" switch of 10 amperes capacity, which we illustrate in fig. 5.

The main improvements consist in the substitution of knife-blade and double-spring-clip contacts for the original face contacts, in the elimination of the porcelain rocker, and in the use of a vitreous porcelain base and of mica insulation on the moving part.

The switch may be fitted with either brass or porcelain cover; the current-carrying parts are well sunk in the base, and provision is made for the attachment of an earthing wire.

Although primarily intended for use on two-way intermediate circuits controlling large numbers of lamps, the switch (or, rather, its movement), has many other—and, in some respects, more important—uses.

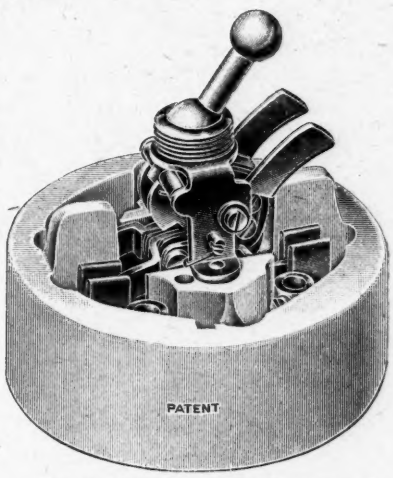


FIG. 5.—NEW 10-AMPERE SWITCH.

Thus, by slight modifications in construction, the switch may be converted into any one of the following types:—

Single-way 20-ampere capacity; in 10-ampere capacity, as single-way with quadruple-break, double-pole, two-way with definite gap in passing over, pilot, reversing, series-parallel, all or part, and one or two special parts.

Some of the above switches are extensively used for the control of heating apparatus and small motors, and others for certain lighting controls. The reversing switch adaptation will be found much more convenient than some of the ancient forms still used in laboratory testing, and other special apparatus.

Modern Steel Works Plant.

One of the oldest works in South Wales engaged in the steel and tin-plate trade, recently brought its plant up-to-date, and electrified a considerable portion of the works.

Probably the most interesting of the motor applications in this works is the electrical driving of the pusher furnaces, which are illustrated in fig. 6. The motors driving these pushers are of the "Witton" reversible intermittent rated type, and have a capacity of 50 H.P.; they are geared to the pushers by spur wheels and rack. One pusher serves for operating two rows of ingots, which it moves alternately. The cold ingots are placed in front of the pusher, which is advanced as soon as the furnace door is opened, and the ingots are forced by successive operations through the furnace. A large roll turning lathe is driven by a direct-coupled

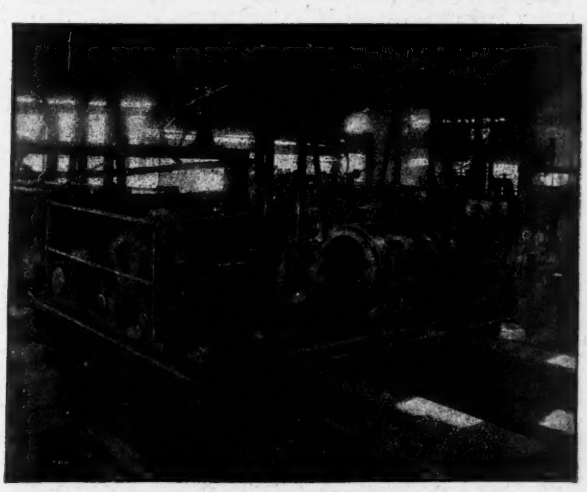


FIG. 6.—50-H.P. THREE-PHASE "WITTON" MOTOR DRIVING A FURNACE PUSHER.

50-H.P. motor through worm gearing. It gives a turning speed on the lathe of 1·5 to 2 R.P.M. by means of a speed controller in the rotor circuit.

Following modern practice, the charging boxes for the steel furnaces are loaded by means of "Witton"-Kramer magnets. As the power generated is alternating current, the magnets, which are 42 in. in diameter, are supplied through motor-generators which convert the three-phase to continuous current. Within six months of the installation of the first magnet, it was realised that very great economies were being effected, and a repeat order was placed for a similar equipment. The electrical equipment for this installation was supplied by the GENERAL ELECTRIC CO., LTD., of Witton, Birmingham.

NEW PATENTS APPLIED FOR, 1914.

NOT YET PUBLISHED.

Compiled expressly for this Journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

14,932. "Receiving instruments for use in submarine sound signalling." J. GARDNER. June 23rd.

14,946. "Electric cables and cable systems and joints for use therein." E. G. WATERS and CALLENDER'S CABLE AND CONSTRUCTION Co., LTD. June 23rd.

14,955. "Electric light prepayment apparatus." H. SIMS, J. BOOTH, and W. MILLER. June 23rd.

14,965. "Electro-magnetic control break-contact burglar alarm." C. S. HAYNES and C. A. PARISH. June 23rd.

14,966. "Electric railways and tramways and railless electric vehicles." E. CROSS. June 23rd.

14,984. "Method of energy supply and control for wagons or trains of electric railways or similar contrivances by means of variation in the pressure of supply." RIGHT HON. C. E. H. HOBHOUSE, W. SLINGO, H. C. GUNTON, and C. H. DOUGLAS. June 23rd.

14,999. "Electric ignition apparatus." E. ROGALSKI. June 23rd. (Complete).

15,024. "Receiving device for subaqueous sound signals." SIGNAL G.M.B.H. June 23rd. (Convention date, July 24th, 1913, Germany). (Complete).

15,031. "Spark gaps for radio-telegraphy." E. GIRARDEAU and J. BERTHENOD. June 23rd. (Addition to 14,884/14. Convention date, February 25th, 1914, Belgium). (Complete).

15,052. "Electric headlights and the like." L. RENAULT. June 23rd. (Convention date, July 1st, 1913, France). (Complete).

15,074. "Thermo electrification of railways, tramways, rail-less carriages, locomotives, trains, and the like self-contained electrically-connected linked-up vehicles." W. P. DURTNALL. June 23rd.

15,076. "Method of regulating the supply of cooling-water for mercury-vapour rectifiers without natural cooling." ALLGEMEINE ELEKTRICITATS GES. June 23rd. (Convention date, June 21st 1913, Germany). (Complete).

15,082. "Mechanical selector for electro-magnetic waves applicable to wireless telegraphic receiving-apparatus." R. B. GOLDSCHMIDT. June 23rd. (Addition to 14,595/14. Convention date, May 2nd, 1914, Belgium). (Complete).

15,125. "Telephone switches." T. GREEN. June 24th.

15,155. "Controlling-arrangements for direct-current electric motors." SOC. ANON. DITE S.T.A.R. SYSTEME DE TRACTION AUTO-REGULATEUR. June 24th. (Convention date, July 21st, 1913, France). (Complete).

15,160. "Electric dischargers more particularly for use in wireless telegraphy and telephony." T. W. STRATFORD-ANDREWS and GALLETTI'S WIRELESS TELEGRAPH AND TELEPHONE Co., LTD. June 24th.

15,182. "Wireless receiving-apparatus." L. C WILLCOX, B. HIPPISLEY, and E. R. CLARKE. June 24th.

15,188. "Electric lighting-apparatus for vehicles." F. L. BASSETT, and J. A. COLE. June 24th.

15,190. "Method of repairing and regenerating incandescent electric lamps." E. LE NAOUR. June 24th.

15,194. "Electric meters." BRITISH THOMSON-HOUSTON Co., LTD. June 24th. (General Electric Co., United States).

15,202. "Pocket magnetic compasses." W. H. HARVEY. June 25th.

15,203. "Means of operating contact-makers." J. DAVIS & SON (Derby), LTD., and W. H. DAVIS. June 25th.

15,224. "Electrically-operated winch, specially applicable as an ash hoist." G. F. D. CAMPBELL. June 25th. (Addition to 20,853/13). (Complete).

15,233. "Apparatus for massaging, heating, electrifying, and similarly treating human or animal bodies." E. KOPPL. June 25th. (Complete).

15,260. "Induction motors." BRITISH WESTINGHOUSE ELECTRIC & MANUFACTURING Co., LTD. June 25th. (Soc. Anon. Westinghouse, France).

15,267. "Manufacture of metal absorption." ELEKTRO-OSMOSE AKT. GES. June 25th. (Convention date, April 29th, 1914, Germany). (Complete).

15,273. "Types for typewriters and typographical setting machines used in the direct reproduction of images transmitted by means of ordinary telegraphic apparatus." U. ELLERO. June 25th. (Convention date, June 25th, 1913, Italy). (Complete).

15,302. "Electric cooking and heating apparatus." W. P. PERRY. June 26th.

15,324. "Apparatus for electrically igniting miners' safety lamps." V. E. JOYCE, and SPAGNOLETTI, LTD. June 26th. (Complete).

15,327. "Electric switch buttons." R. LIEBISCH. June 26th.

15,329. "Metal filament glow lamps." SIEMENS BROS. & Co., LTD., and W. H. LE MARECHAL. June 26th.

15,336. "Method of controlling the vacuum of X-ray tubes." R. S. WRIGHT, and E. E. BURNSIDE. June 26th.

15,338. "Telephone systems." AUTOMATIC TELEPHONE MANUFACTURING Co., LTD. June 26th. (Automatic Electric Co., United States). (Complete).

15,339. "Electric switching device." M. BOCK. June 26th. (Complete.)

15,352. "Oiling devices for magnetos for the ignition of motors." SOC. D'ELECTRICITE NILMELIOR. June 26th. (Convention date, June 27th, 1913, Belgium). (Complete).

15,353. "Magnetos." J. F. J. BETHENOD. June 26th. (Convention date, June 27th, 1913, Belgium). (Complete).

15,356. "Protective apparatus for electrical machines and circuits." J. S. HIGHFIELD, and W. DUDDELL. June 26th.

15,363. "Method of enclosing portable electric batteries and a device therefor." B. PORDES. June 26th.

15,380. "Sparking-plugs." SOC. CARPENTIER, BAL. ET CIE. June 26th. (Convention date, January 7th, 1914, Germany). (Complete).

15,388. "Detectors for electro-magnetic waves or the like." B. STARIE. June 26th.

15,399. "Vacuum-tube lighting apparatus." F. MEYER. June 26th. (Convention date, June 28th, 1913, Germany). (Complete).

15,400. "Automatically locking and unlocking carriage doors of passenger trains, electrically controlled." V. L. COLCLOUGH. June 27th.

15,404. "High-tension sparking plug for internal combustion engines, with special reference to the engines of motor-vehicles and motor-cycles." F. WOOD, and A. H. WILDE. June 27th.

15,405. "Railway safe-running devices." A. R. ANGUS. June 27th.

15,431. "Overhead electric locomotion for the purpose of conveying passengers and goods." H. KLINCKE. June 27th.

15,455. "Electric furnaces." F. J. MACHALSKE. June 27th. (Convention date, June 27th, 1913, United States). (Complete).

15,456. "Electrodes." F. J. MACHALSKE. June 27th. (Convention date, June 27th, 1913, United States). (Complete).

15,464. "Electric starting-device for internal combustion engines." L. RENAULT. June 27th. (Convention date, July 12th, 1913, France). (Complete).

15,471. "Circuit arrangements for telephone systems." SIEMENS BROS. and Co., LTD. June 27th. (Siemens & Halske Akt. Ges, Germany). (Complete).

15,485. "Negative arc-lamp carbon for high specific loads." PLANIAWERKE AKT. GES. FUR KOHLENFABRIKATION. June 27th. (Convention date, March 6th, 1914, Germany). (Complete).

15,487. "Magnetos." J. F. J. BETHENOD. June 27th. (Addition to 15,353/14. (Convention date, July 9th, 1913, Belgium). (Complete).

15,489. "Electric lamps and their holders." F. JONES. June 27th. (Complete).

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

18,368. MULTIPLEX TELEGRAPHIC PRINTING APPARATUS FOR AUTOMATIC AND MANUAL TRANSMISSION AND OF HIGH OUTPUT, ALSO CAPABLE OF BEING USED WITH SUBMARINE CABLES. A. Colonna. August 9th. (June 7th, 1913).

1913.

9,930. ELECTRIC WATER HEATERS AND THE LIKE. R. Weaving, and Ferranti, Ltd. April 28th. (Cognate Applications, 11,896/13 and 23,527/13).

10,803. ELECTRIC RAILWAY SIGNALLING SYSTEMS. J. B. Mouyen. May 7th. (May 8th, 1912).

12,889. ILLUMINATED ADVERTISING DEVICES. W. W. Lower.

12,936. ELECTRIC MOTOR STARTERS. J. Roothaan, and Ferranti, Ltd. June 4th.

13,006. MAGNETO-ELECTRIC IGNITION APPARATUS. Unterberg & Helmle. June 4th. (March 15th, 1913).

13,173. SAFETY DEVICE FOR THE STARTING OF MOTOR CARS. E. Charageat. June 6th. (Patent of Addition not granted).

13,242. TRAIN CONTROL APPARATUS. W. B. Murray. June 7th.

13,243. ELECTRICAL TRAIN CONTROL SYSTEM. W. B. Murray. June 7th.

13,250. ELECTRIC FURNACE WITH ROTARY FLAME FOR THE TREATMENT OF GASES AND VAPOURS. I. Moscicki. June 7th.

13,310. METHODS OF CONTROLLING DISTANT APPARATUS BY ELECTRO-MAGNETIC WAVES. J. H. Hammond, Junr. June 9th. (June 7th, 1912).

13,323. ARTIFICIAL LIGHTING APPARATUS FOR PORTRAIT PHOTOGRAPHY. R. A Higgs. June 9th.

13,358. ELECTRIC SUPPLY DEVICES FOR SERIES LIGHTING AND OTHER PURPOSES. J. P. Naylor & Naylorgraph, Ltd. June 9th.

13,465. SEPARATION OF LIQUID SUSPENSIONS. British Thomson-Houston Co. (General Electric Co.). June 10th.

13,480. APPARATUS FOR TESTING THE SPECIFIC GRAVITY OF ACID IN CELLS WITH SEALED COVERED. D. P. Battery Co. and T. C. Elliott. June 11th.

13,636. RECEIVERS FOR USE IN WIRELESS TELEGRAPHY AND TELEPHONY. Marconi's Wireless Telegraph Co. & C. S. Franklin. June 12th.

13,637. MEANS FOR INCREASING THE FREQUENCY OF ALTERNATING CURRENTS. Marconi's Wireless Telegraph Co. & C. S. Franklin. June 28th.

13,748. SELECTORS FOR AUTOMATIC OR SEMI-AUTOMATIC TELEPHONE SYSTEMS. Siemens & Halske Akt. Ges. June 13th. (June 22nd, 1912).

13,764. ELECTRICAL RESISTANCES. W. M. Mordey. June 13th.

14,994. AUTOMATIC ELECTRIC SWITCHES GOVERNING DUAL-RATE ENERGY METERS. H. H. Perry. June 30th.

16,815. CASH, STAMP, PARCEL, OR THE LIKE TRAY, IN COMBINATION WITH AN ILLUMINATED SIGN FOR ADVERTISING PURPOSES. R. A. Pantlin. July 22nd.

16,963. ELECTRICAL STARTING-APPARATUS FOR INTERNAL COMBUSTION VEHICLES. W. A. Trier. July 24th.

18,438. RELAYS. R. Zei & J. Nardin. August 13th. (August 13th, 1912).

19,121. TELEGRAPHIC RECEIVERS AND RELAYS THEREFOR, AND FOR ANALOGOUS PURPOSES. Eastern Telegraph Co. & A. Fraser. August 22nd.

19,250. LAMP AND THE LIKE REFLECTORS OR GLOBES. B. J. Grigsby, G. Campbell, & R. A. Ives. August 25th.

20,320. INDICATING MEANS CONNECTED WITH RAILWAY CARRIAGE AND LIKE DOORS, AND MEANS COMBINABLE THEREWITH FOR AUTOMATICALLY ACTUATING THE VACUUM BRAKES OF RAILWAY TRAINS. W. K. Kaye. September 9th.

21,309. ELECTRIC ROTARY TRANSFORMERS. Soc. Schneider et Cie. September 20th. (October 31st, 1912).

22,235. CONSTRUCTION OF ELECTRIC FANS. S. G. Leach. October 2nd.

22,841. SECONDARY GALVANIC BATTERIES. A. Iconomus. October 9th.

25,018. ELECTRIC RAILWAY SIGNALLING AND MEANS THEREFOR. Siemens Bros. and Co. & J. Boot. November 3rd.

25,393. PROCESS FOR OBTAINING ADHESIVE COATINGS OF COPPER UPON IRON AND STEEL. S. O. Cowper-Coles. November 6th.

25,716. ELECTRICAL RESISTANCE-MEASURING APPARATUS. M. E. Leeds. November 10th. (November 18th, 1912).

26,278. AUTOMATIC TELEGRAPH TRANSMITTERS. Eastern Telegraph Co., K. L. Wood, and A. Fraser. November 15th.

26,997. TESTING INSTRUMENTS FOR ELECTRIC CONDUCTORS. C. L. Faries. November 24th.

27,753. TELEPHONE SYSTEMS. E. A. Graham. December 2nd.

27,859. ELECTRO-MAGNETICALLY-CONTROLLED PERFORATING APPARATUS. B. Soldatencow. December 3rd. (Addition to and Divided Application on 5,352/13, March 3rd).

1914.

253. DYNAMO-ELECTRIC MACHINES. R. H. Lane. January 5th.

310. TELEPHONE SYSTEMS. E. A. Graham. January 5th.

1,421. METHOD OF AND MEANS FOR THE PRODUCTION OF LIGHT FROM HIGH-TENSION MAGNETO MACHINES USED FOR IGNITION PURPOSES. A. E. Twiddy, and J Stally. January 19th.

2,493. ELECTRIC LOCK AND ALARM APPARATUS. O. Nitsch. January 30th.

3,756. IGNITION DEVICES FOR INTERNAL COMBUSTION ENGINES. W. Peck. February 13th.

4,663. ELECTRIC CIRCUIT-INTERRUPTERS. British Westinghouse Electric and Manufacturing Co. (Westinghouse Electric and Manufacturing Co.). February 23rd.

6,892. AUTOMATIC COIN-FREED DEVICES FOR AUTOMATIC TELEPHONE INSTALLATIONS. Siemens & Halske Akt. Ges. March 18th. (July 24th, 1913).

8,831. TELEPHONIC SYSTEMS. E. A. Graham, and E. A. Sanftleben. April 7th. (Addition to 767/14).

8,906. TELEPHONIC SYSTEMS. E. A. Graham, W. J. Rickets, and E. A. Sanftleben. April 8th. (Addition to 6,356/14).

8,916. ELECTRICAL REGULATING DEVICES. Robert Bosch (Firm of), and G. Honold. April 8th. (Addition to 27,961/12).

10,041. ELECTRIC SWITCHES. P. S. Turner. April 23rd. (Divided Application on 14,112/13, June 18th).

12,633. METHODS OF CONTROLLING DISTANT APPARATUS BY HERTZIAN WAVES. J. H. Hammond, Junr. May 22nd. (Divided Application on 13,310. June 9th).